



Clinical science

Implementing treat-to-target urate-lowering therapy during hospitalizations for gout flares

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Abstract

Objectives: To evaluate a strategy designed to optimize care and increase uptake of urate-lowering therapy (ULT) during hospitalizations for gout flares.

Methods: We conducted a prospective cohort study to evaluate a strategy that combined optimal in-hospital gout management with a nurse-led, follow-up appointment, followed by handover to primary care. Outcomes, including ULT initiation, urate target attainment and re-hospitalization rates, were compared between patients hospitalized for flares in the 12 months post-implementation and a retrospective cohort of hospitalized patients from 12 months pre-implementation.

Results: One hundred and nineteen and 108 patients, respectively, were hospitalized for gout flares in the 12 months pre- and post-implementation. For patients with 6-month follow-up data available ($n=94$ and $n=97$, respectively), the proportion newly initiated on ULT increased from 49.2% pre-implementation to 92.3% post-implementation (age/sex-adjusted odds ratio [aOR] 11.5; 95% CI 4.36, 30.5; $P<0.001$). After implementation, more patients achieved a serum urate $\leq 360 \mu\text{mol/l}$ within 6 months of discharge (10.6% pre-implementation vs 26.8% post-implementation; aOR 3.04; 95% CI 1.36, 6.78; $P=0.007$). The proportion of patients re-hospitalized for flares was 14.9% pre-implementation vs 9.3% post-implementation (aOR 0.53; 95% CI 0.22, 1.32; $P=0.18$).

Conclusion: Over 90% of patients were initiated on ULT after implementing a strategy to optimize hospital gout care. Despite increased initiation of ULT during flares, recurrent hospitalizations were not more frequent following implementation. Significant relative improvements in urate target attainment were observed post-implementation; however, for the majority of hospitalized gout patients to achieve urate targets, closer primary–secondary care integration is still needed.

Keywords: gout, crystal arthritis, hospital, admissions, urate-lowering therapy, allopurinol.

Rheumatology key messages

- After optimizing hospital gout care, more than 90% of patients were initiated on urate-lowering therapy.
- Significant relative improvements in urate target attainment were seen following a single, nurse-led, post-discharge appointment.
- However, for the majority of hospitalized gout patients to achieve target, closer primary–secondary care integration is still needed.

Introduction

Hospitalizations for gout flares have increased markedly over the last 20 years, doubling in the USA, England and Canada [1–4]. These increases have occurred despite widespread

availability of urate-lowering therapies (ULT), such as allopurinol and febuxostat. When titrated to achieve serum urate targets $\leq 360 \mu\text{mol/l}$, ULT prevents flares, improves quality of life and leads to long-term reductions in hospitalizations

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[5–7]. International guidelines have been updated to encourage the uptake of treat-to-target ULT [8–11]. However, population-level data continue to show that ULT is initiated in only a minority of patients, while few patients achieve the urate targets necessary to prevent flares and hospitalizations [6, 12–14].

For avoidable gout admissions to be prevented, strategies are needed to optimize care and increase uptake of treat-to-target ULT in hospitalized patients. A recent systematic review found a paucity of high-quality studies in people hospitalized for gout [15]. Specifically, no prospective studies to date had evaluated strategies designed to encourage ULT uptake and prevent re-admissions in hospitalized patients [15]. We sought to address this knowledge gap.

In this study, we evaluated a strategy designed to optimize hospital gout care and increase uptake of ULT. Our strategy was modelled on a nurse-led intervention shown to be highly effective at optimizing gout management in primary care [5]. We adapted this strategy for implementation during hospitalizations for flares, and assessed outcomes including ULT initiation, serum urate target attainment and rates of re-hospitalization.

Methods

Study design and intervention

We performed a prospective cohort study at a large teaching hospital in South London, UK, which serves a population of over 1 million people. We evaluated outcomes after implementation of a strategy designed to optimize care for people hospitalized for gout flares, and compared these outcomes with a retrospective cohort of hospitalized patients from before implementation.

The intervention package consisted of two key components: (i) an in-hospital gout management pathway ([Supplementary Data S1](#), available at *Rheumatology* online), based on British Society for Rheumatology (BSR), European Alliance of Associations for Rheumatology (EULAR), and American College of Rheumatology (ACR) gout management guidelines [8–10]; and (ii) a nurse-led telephone appointment performed 2 weeks after discharge.

The intervention was developed with extensive stakeholder input, following a systematic literature review [15], audit and process mapping of gout care at our hospital [16]. The management pathway was designed as a quick-reference guide on optimal gout care for use by frontline clinicians and rheumatologists. This included recommendations on: diagnostic tests (including serum urate levels and joint aspiration); rheumatologist input; flare treatments (NSAIDs, colchicine and/or corticosteroids, where appropriate); offering ULT (allopurinol first-line) to all patients unless contraindicated; initiating ULT during the acute flare; considering prophylaxis against flares during ULT initiation and titration; admission-avoidance strategies (e.g. ambulatory care units); disease education; and post-discharge advice (including treat-to-target ULT optimization, as recommended in the BSR gout management guideline [8]).

A nurse-led telephone clinic was established to provide patients with a single follow-up appointment within 2 weeks of discharge. This clinic was delivered on a weekly basis by a specialist rheumatology nurse, trained in gout management, with appointments lasting ~30 min per patient. Objectives

were to review symptoms, provide disease education, discuss flare management strategies, and provide advice to patients and their primary care team on ULT dose optimization using a treat-to-target strategy [8]. After this appointment, care was handed over to the patient's primary care team via a clinical letter. For patients with severe gout and/or recurrent admissions, additional rheumatology outpatient follow-up could be considered.

To maximize uptake of the intervention, a multi-pronged implementation strategy was developed with implementation experts. This incorporated strategies from the Expert Recommendations for Implementing Change (ERIC) guidance [17], including digital order sets, study champions, education sessions, advertising, executive approval, quality monitoring and clinician feedback ([Supplementary Data S2](#), available at *Rheumatology* online).

Study period

The study period was from 30 October 2020 to 29 April 2023. The intervention was launched on 30 October 2021. Data were collected prospectively on all patients hospitalized with gout flares in the 12-month period after intervention launch (30 October 2021–29 October 2022). Post-implementation outcomes were compared with outcomes for patients hospitalized with gout in the 12-month period prior to launch (30 October 2020–29 October 2021). All patients with linked primary care data were followed up for 6 months after discharge to review post-discharge outcomes (detailed below).

Case definitions

All emergency department (ED) attendances and admission episodes for gout flares (collectively referred to as hospitalizations) in the pre- and post-implementation periods were included. Both primary and secondary admission diagnoses of gout (e.g. flares occurring during hospitalizations for other reasons) were eligible, assuming gout was deemed the likely cause of the acute joint symptoms by the primary clinical team. Although recommended in our pathway, confirmatory joint aspiration and/or rheumatology input were not mandated, as reflects local clinical practice. Patients managed solely in an urgent care centre (primarily staffed by general practitioners rather than ED clinicians) were excluded, as the urgent care centre facility at our hospital was transferred to another institution prior to intervention launch.

Data sources

All data used in these analyses were routinely captured during clinical care. In-hospital data were extracted from electronic patient records. Post-discharge data were extracted from local care records, containing primary and secondary care data for patients with linked NHS identifiers who had not opted out of this service [18]. All data were manually validated by a rheumatologist, and pseudonymized for the purposes of analysis. Outcomes were selected a priori with stakeholder input.

Baseline characteristics

Baseline data were collected as follows: age; sex; admission type (ED attendance-only *vs* hospital admission); day/time of presentation (defined as out-of-hours if occurring between 9 p.m. and 9 a.m. or on a Saturday/Sunday); pre-existing gout diagnosis; pre-existing prescription for ULT (allopurinol,

febuxostat, benzbromarone, sulfinpyrazone or probenecid); and baseline blood tests, if performed during the presentation (serum urate, CRP, white cell count, neutrophil count, lymphocyte count and serum creatinine).

Outcomes during hospitalization

Data were captured to ascertain whether the following outcomes occurred during the hospitalization episode: rheumatology input sought; serum urate level performed; joint aspiration performed; flare treatment(s) prescribed (NSAID, colchicine and/or oral, intramuscular, intravenous or intra-articular corticosteroids); disease education provided to patients; ULT initiated (if patient not already receiving ULT) or up-titrated (if patient already receiving ULT at a sub-optimal dose); prophylaxis prescribed (low-dose colchicine, NSAIDs or corticosteroids); gout-specific recommendations and/or follow-up on discharge.

Outcomes after hospitalization

For patients with available follow-up data, we ascertained whether the following outcomes occurred within 6 months of discharge: ULT initiation and/or up-titration; prescription of prophylaxis against flares during ULT initiation/titration; number of serum urate levels performed; attainment of serum urate targets $\leq 360 \mu\text{mol/l}$ and/or $\leq 300 \mu\text{mol/l}$; follow-up in the gout telephone clinic and/or rheumatology outpatient clinic; re-attendance at ED and/or re-admission with a subsequent gout flare (occurring >7 days after discharge from the initial presentation).

Statistical methods

Baseline characteristics were tabulated, and between-cohort differences estimated using the chi-square test for categorical variables and an independent Student's *t*-test for continuous variables. Logistic regression, with adjustment for age and sex, was used to estimate differences in categorical outcomes between pre- and post-implementation cohorts, expressed as adjusted odds ratios (aOR) with 95% CI. Linear regression, with adjustment for age and sex, was used to estimate differences in continuous outcomes, expressed as adjusted β -coefficients ($a\beta$) with 95% CI. Kaplan–Meier survival curves were presented for repeat hospitalizations. Univariable logistic regression was performed to explore a differential impact of the intervention on patient subgroups, categorized by age, sex, admission type, time of presentation, whether the gout diagnosis was pre-existing, or whether rheumatology input was sought during hospitalization. Stata v17 (StataCorp, College Station, TX, USA) was used for all analyses. No adjustment was performed for multiple hypothesis testing, as this was an exploratory study.

Study approval and ethics

Approval to undertake this study under the remit of service evaluation was obtained from King's College Hospital NHS Foundation Trust. No further ethical approval or written informed patient consent was required, as per UK Health Research Authority guidance.

Patient and public involvement

Patients have been closely involved in all stages of this project. Patient feedback was instrumental in conceptualizing this project, and in designing the intervention. In particular, patients emphasized the importance of a holistic, multi-

faceted intervention and implementation strategy, recognizing that a single intervention was unlikely to address the multiple barriers to optimal hospital gout care. Patients will be closely involved in disseminating the findings of this study, and in developing follow-on projects.

Results

Baseline characteristics

In the 12 months prior to implementation of the intervention, 119 people attended ED with gout flares, of whom 63 (52.9%) required admission to hospital. In the 12 months after implementation, 108 attended ED with gout flares, of whom 53 (49.1%) required admission. A study flowchart is shown in Fig. 1.

Baseline characteristics are shown in Table 1. Pre- and post-implementation cohorts had similar mean ages (62 *vs* 64 years, respectively). There were proportionally more female patients in the pre- than post-implementation cohort (26.9% *vs* 15.7%). The proportion of patients who had pre-existing gout diagnoses was similar in the pre- and post-implementation cohorts (66.4% *vs* 67.6%); 41.8% and 27.4% of known gout patients in the pre- and post-implementation cohorts, respectively, were receiving ULT prior to hospitalization. Mean serum urate levels at baseline were comparable (485 *vs* 487 $\mu\text{mol/l}$).

Outcomes during hospitalizations

In-hospital outcomes were compared before and after implementation (Table 2). Following implementation, specialist rheumatology input was obtained more frequently in hospital (54.6% pre-implementation *vs* 75.9% post-implementation; aOR 2.48; 95% CI 1.37, 4.52; $P = 0.003$); serum urate levels were performed in more patients (66.4% *vs* 92.6%; aOR 6.32; 95% CI 2.75, 14.5; $P < 0.001$); and joint aspiration was performed more frequently (19.3% *vs* 47.2%; aOR 3.44; 95% CI 1.88, 6.27; $P < 0.001$).

Of pre- and post-implementation cohorts, 93.3% and 98.1%, respectively, received a guideline-recommended flare treatment. After implementation, more patients were prescribed colchicine (62.2% *vs* 79.6%; aOR 2.30; 95% CI 1.23, 4.31; $P = 0.009$), corticosteroids (21.0% *vs* 37.0%; aOR 2.20; 95% CI 1.21, 4.02; $P = 0.010$) or multiple flare treatments (17.6% *vs* 45.4%; aOR 4.10; 95% CI 2.20, 7.67; $P < 0.001$). Use of intra-articular corticosteroids increased modestly from a low baseline (1.7% *vs* 8.3%; aOR 5.53; 95% CI 1.15, 26.7; $P = 0.033$). There was no significant difference in the use of NSAIDs (31.9% *vs* 31.5%; aOR 1.18; 95% CI 0.61, 2.28; $P = 0.63$).

The proportion of patients initiated and/or up-titrated on ULT prior to discharge increased markedly following implementation, from 17.6% to 62.0% (aOR 7.69; 95% CI 4.12, 14.4; $P < 0.001$). After implementation, more patients were provided with gout-specific management recommendations on discharge (58.8% *vs* 86.1%; aOR 4.33; 95% CI 2.21, 8.48; $P < 0.001$). Documented evidence of disease education provision prior to discharge was low in both cohorts (22.7% *vs* 22.2%; aOR 1.00; 95% CI 0.53, 1.90; $P = 0.99$).

Outcomes after hospitalizations

Of the patients in the pre- and post-implementation cohorts, 94/119 (79.0%) and 97/108 (89.8%), respectively, had

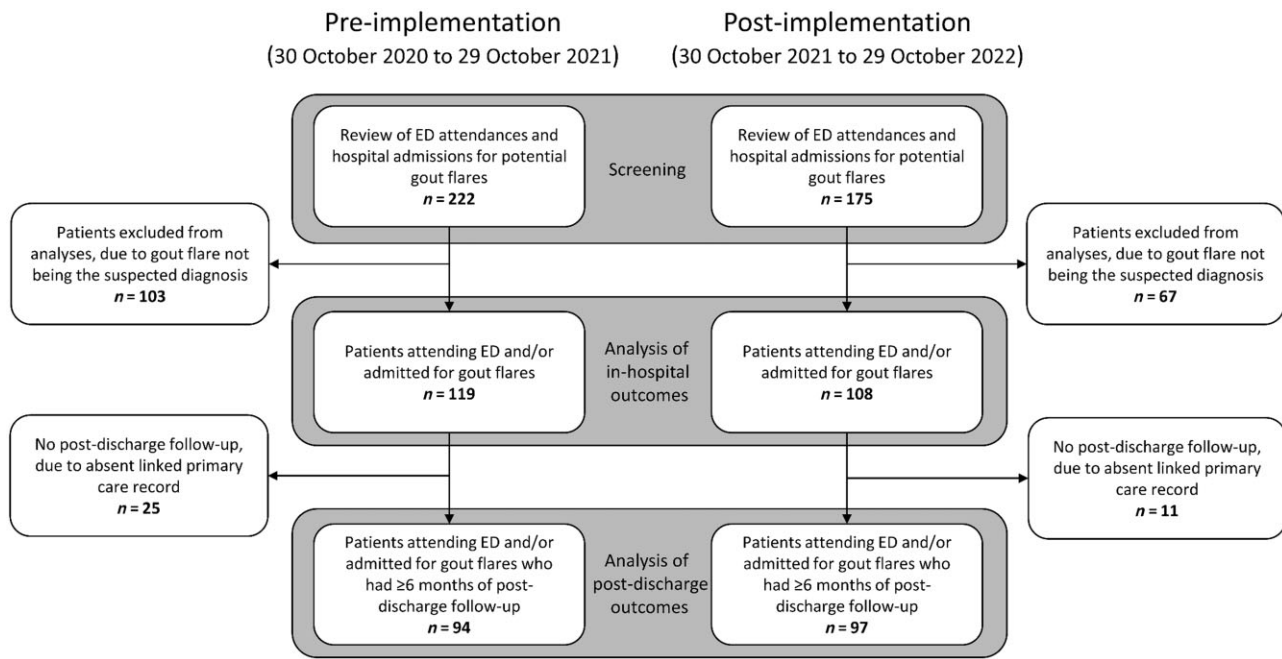


Figure 1. Study flowchart depicting the pre- and post-implementation study cohorts. ED: emergency department

Table 1. Baseline characteristics of the pre- and post-implementation cohorts

Characteristic	Pre-implementation (<i>n</i> = 119)	Post-implementation (<i>n</i> = 108)	<i>P</i> -value
Age, mean (s.d.), years	62 (16)	64 (16)	0.31
Sex, <i>n</i> (%)			
Female	32 (26.9)	17 (15.7)	0.041
Male	87 (73.1)	91 (84.3)	
Admission type, <i>n</i> (%)			
Discharged from ED	56 (47.1)	55 (50.9)	0.56
Admitted to hospital	63 (52.9)	53 (49.1)	
Presented out-of-hours, <i>n</i> (%)	59 (49.6)	43 (39.8)	0.14
Pre-existing gout diagnosis, <i>n</i> (%)	79 (66.4)	73 (67.6)	0.85
Receiving ULT prior to hospitalization, <i>n</i> (%)	33 (41.8)	20 (27.4)	0.063
Not on ULT prior to hospitalization, <i>n</i> (%)	46 (58.2)	53 (72.6)	
Serum urate at baseline, mean (s.d.), $\mu\text{mol/l}$	485 (185)	487 (125)	0.94
CRP at baseline, mean (s.d.), mg/l	89 (84)	76 (79)	0.28
White cell count at baseline, mean (s.d.), $\times 10^9/\text{l}$	9.3 (3.5)	9.5 (4.6)	0.76
Neutrophil count at baseline, mean (s.d.), $\times 10^9/\text{l}$	6.6 (3.1)	6.5 (3.9)	0.79
Lymphocyte count at baseline, mean (s.d.), $\times 10^9/\text{l}$	1.6 (0.8)	1.8 (0.9)	0.14
Creatinine at baseline, mean (s.d.), $\mu\text{mol/l}$	165 (161)	142 (116)	0.24

Blood test results represent the first tests performed during the hospitalization. Inferential statistics for between-cohort differences were obtained from independent *t*-tests for continuous variables and chi-square tests for categorical variables. ULT: urate-lowering therapy.

primary care follow-up data available to facilitate analyses of post-discharge outcomes (Table 3). By 6 months post-discharge, 91/97 (93.8%) of the post-implementation cohort were prescribed ULT, compared with 61/94 (64.9%) pre-implementation (aOR 7.68; 95% CI 3.02, 19.6; $P < 0.001$). When restricted to patients not receiving ULT prior to hospitalization, the proportion of patients who newly initiated ULT in hospital or within 6 months of discharge increased markedly after implementation, from 49.2% to 92.3% (aOR 11.5; 95% CI 4.36, 30.5; $P < 0.001$). Of all patients receiving ULT by 6 months, 57/61 (93.4%) and 90/91 (98.9%) of the pre- and post-implementation cohorts, respectively, were prescribed allopurinol. There was no significant difference in prophylaxis use between patients newly initiating ULT in the

pre- vs post-implementation periods (25.0% vs 29.2%; aOR 1.12; 95% CI 0.42, 2.98; $P = 0.81$).

Following implementation, more patients achieved a serum urate $\leq 360 \mu\text{mol/l}$ within 6 months of discharge: 10/94 (10.6%) pre-implementation vs 26/97 (26.8%) post-implementation (aOR 3.04; 95% CI 1.36, 6.78; $P = 0.007$). There was no significant difference in the proportion of patients achieving a serum urate $\leq 300 \mu\text{mol/l}$ within 6 months (5.3% pre-implementation vs 13.4% post-implementation; aOR 2.65; 95% CI 0.89, 7.84; $P = 0.079$). Mean reductions in serum urate at 6 months, relative to baseline, were $29.7 \mu\text{mol/l}$ pre-implementation vs $96.8 \mu\text{mol/l}$ post-implementation (a β -64.3 ; 95% CI $-128.0, -0.64$; $P = 0.048$). The mean number of serum urate levels

Table 2. Outcomes during hospitalizations for gout flares, comparing the pre- and post-implementation cohorts

Outcome	Pre-implementation, n (%) (n = 119)	Post-implementation, n (%) (n = 108)	Odds ratio (95% CI)	P-value
Rheumatology input during hospitalization	65 (54.6)	82 (75.9)	2.48 (1.37, 4.52)	0.003
Serum urate level performed	79 (66.4)	100 (92.6)	6.32 (2.75, 14.5)	<0.001
Joint aspiration performed	23 (19.3)	51 (47.2)	3.44 (1.88, 6.27)	<0.001
Flare treatment prescribed	111 (93.3)	106 (98.1)	4.46 (0.91, 21.8)	0.065
NSAIDs	38 (31.9)	34 (31.5)	1.18 (0.61, 2.28)	0.63
Colchicine	74 (62.2)	86 (79.6)	2.30 (1.23, 4.31)	0.009
Corticosteroids	25 (21.0)	40 (37.0)	2.20 (1.21, 4.02)	0.010
Multiple flare treatments prescribed	21 (17.6)	49 (45.4)	4.10 (2.20, 7.67)	<0.001
Intra-articular steroid injection	2 (1.7)	9 (8.3)	5.53 (1.15, 26.7)	0.033
Disease education documented prior to discharge	27 (22.7)	24 (22.2)	1.00 (0.53, 1.90)	0.99
ULT initiated and/or titrated during hospitalization	21 (17.6)	67 (62.0)	7.69 (4.12, 14.4)	<0.001
Gout recommendations documented on discharge	70 (58.8)	93 (86.1)	4.33 (2.21, 8.48)	<0.001
Recommendation to initiate and/or titrate ULT after discharge	18 (15.1)	42 (38.9)	3.26 (1.71, 6.19)	<0.001
Recommendation for prophylaxis while titrating ULT	23 (19.3)	13 (12.0)	0.54 (0.26, 1.15)	0.11
Recommendation for target serum urate level	13 (10.9)	28 (25.9)	2.56 (1.23, 5.36)	0.012
Recommendation for primary care follow-up	53 (44.5)	43 (39.8)	0.82 (0.48, 1.41)	0.47
Recommendation for rheumatology/gout clinic follow-up	11 (9.2)	73 (67.6)	19.8 (9.34, 42.0)	<0.001

Odds ratios from logistic regression models are shown, with adjustment for age and sex. ULT: urate-lowering therapy.

Table 3. Outcomes in the 6-month period after hospitalizations for gout flares, comparing the pre- and post-implementation cohorts

Outcome	Pre-implementation, n (%) (n = 94)	Post-implementation, n (%) (n = 97)	Odds ratio (95% CI)	P-value
Receiving ULT by 6 months	61 (64.9)	91 (93.8)	7.68 (3.02, 19.6)	<0.001
ULT initiated in hospital or within 6 months of discharge				
Yes	32 (49.2)	72 (92.3)	11.5 (4.36, 30.5)	<0.001
No	33 (50.8)	6 (7.7)		
Receiving ULT pre-admission	29	19		
Prophylaxis prescribed while initiating ULT				
Yes	8 (25.0)	21 (29.2)	1.12 (0.42, 2.98)	0.81
No	24 (75.0)	51 (70.8)		
Not newly initiated on ULT	62	25		
Serum urate performed at least once within 6 months	30 (31.9)	56 (57.7)	2.88 (1.58, 5.25)	0.001
Serum urate $\leq 360 \mu\text{mol/l}$ within 6 months	10 (10.6)	26 (26.8)	3.04 (1.36, 6.78)	0.007
Serum urate $\leq 300 \mu\text{mol/l}$ within 6 months	5 (5.3)	13 (13.4)	2.65 (0.89, 7.84)	0.079
Rheumatology outpatient clinic within 6 months	8 (8.5)	16 (16.5)	2.08 (0.82, 5.28)	0.12
Gout telephone clinic within 6 months	N/A	79 (81.4)	—	—
Re-presented to hospital within 6 months	14 (14.9)	9 (9.3)	0.53 (0.22, 1.32)	0.18

Odds ratios from logistic regression models are shown, with adjustment for age and sex. A gout telephone clinic was established as part of the intervention package, and therefore was not available to patients in the pre-implementation cohort. N/A: not available; ULT: urate-lowering therapy.

performed within 6 months increased from 0.5 tests pre-implementation to 1.1 tests post-implementation (a β 0.55; 95% CI 0.14, 0.96; $P = 0.009$).

Of the post-implementation cohort, 79/97 (81.4%) were reviewed in the nurse-led gout telephone clinic (median time to review: 12 days), while 16/97 (16.5%) patients received rheumatology outpatient follow-up within 6 months. Prior to implementation, 8/94 (8.5%) patients received rheumatology outpatient follow-up within 6 months of discharge.

The number of patients who re-attended ED and/or were re-admitted for gout flares within 6 months of discharge was 14/94 (14.9%) pre-implementation vs 9/97 (9.3%) post-implementation (aOR 0.53; 95% CI 0.22, 1.32; $P = 0.18$). Survival curves for repeat hospitalizations are shown in Fig. 2.

Further analyses were performed to explore the impact of the intervention on different subgroups of patients (Supplementary Figs S1–S4, available at *Rheumatology* online). Odds of ULT initiation were significantly higher in the post-implementation than pre-implementation cohort,

irrespective of age, sex, admission type, time of presentation, whether the gout diagnosis was pre-existing or whether rheumatology input was sought during hospitalization (Supplementary Fig. S1, available at *Rheumatology* online).

Discussion

Following implementation of a strategy designed to optimize care during gout hospitalizations, >90% of ULT-naïve patients were initiated on ULT—nearly double the pre-implementation baseline. Many other aspects of care improved, including urate target attainment and post-discharge follow-up. The initiation of ULT during flares did not increase recurrent hospitalizations, supporting the use of ULT in this setting.

Our intervention was modelled on one shown to be highly effective in a primary care setting. In a large randomized controlled trial in the UK, nurse-delivered patient education and treat-to-target ULT resulted in 95% of patients achieving

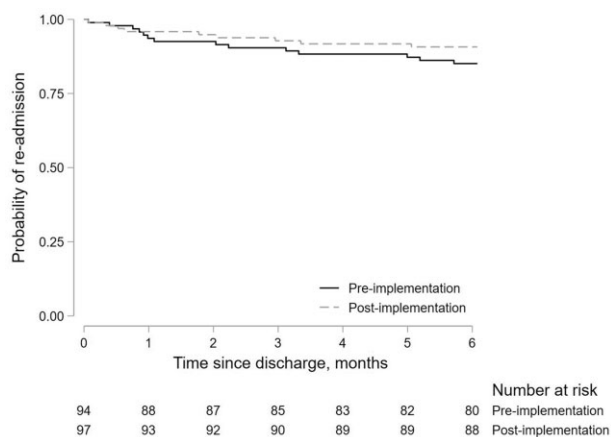


Figure 2. Survival curve showing the probability of re-attendance at ED and/or re-admission to hospital for gout flares following discharge. Pre-implementation (solid line) and post-implementation (dashed line) cohorts are shown. The number of patients at risk at each time point is shown in a risk table

serum urate targets within 1 year, compared with 26% with usual care [5]. Flare frequency, tophi and quality of life all improved, and the intervention was shown to be cost-effective. We adapted this intervention for implementation in a hospital setting. As well as optimizing care during patients' hospital stays, we established a nurse-led, post-discharge clinic to facilitate disease education and provide advice on ULT optimization. This appointment was delivered as a single telephone appointment, recognizing that in-person appointments can be challenging for patients to attend after hospitalizations for flares. Care was then handed over to patients' primary care teams for ongoing management.

Following implementation of this strategy, many aspects of hospital gout care improved: joint aspirations increased; serum urate levels were performed more frequently; use of guideline-recommended flare treatments increased (particularly combination therapy); and gout-specific follow-up was provided to more patients. Rheumatologist input also increased; specialist support for frontline clinicians was felt to be an important facilitator of optimal gout care during our stakeholder consultations [16], supported by previous analyses demonstrating that rheumatology input associates with improvements in care for hospitalized gout patients [19–22].

The biggest change observed following implementation of our strategy was increased initiation of ULT. By 6 months post-discharge, 94% of patients had been prescribed ULT. This is comparable to ULT initiation rates in the Nottingham primary care-based study [5], and substantially better than the 61% of patients who were receiving ULT within 12 months of hospitalization in a recent UK-wide analysis [6]. In particular, there was a 3-fold increase in the proportion of patients initiating and/or up-titrating ULT prior to discharge. There has been extensive debate around the relative benefits and harms of early ULT initiation (*vs* deferred initiation of ULT after flare resolution), with international guidelines varying widely in this regard [8, 10, 11]. We advocated for early ULT initiation for several reasons. First, hospitalizations provide unique opportunities for clinicians to optimize care for people with long-term conditions, such as gout. Second, accumulating evidence suggests that upfront initiation of ULT does not prolong or worsen intercurrent flares, provided it is

initiated alongside flare treatment [23–26]. Third, earlier initiation of ULT leads to more timely reductions in serum urate levels [23–26]. Finally, this approach can help to mitigate a breakdown in communication between secondary care and primary care, whereby post-discharge recommendations to initiate ULT are not acted upon [19].

Despite the marked increase in ULT initiation during flares, we did not observe an increase in hospitalizations for recurrent flares after implementing this strategy. These real-world data support those obtained from trial settings [23–26]. Although not statistically significant, proportionately fewer re-hospitalizations occurred after implementation, relative to before (37.6% relative reduction; 5.6% absolute reduction), suggesting a potential for benefit with this approach. One contributory factor might have been the post-discharge follow-up appointment, which gave patients an opportunity to have any ongoing symptoms reviewed. Advice on flare management was provided within this appointment, empowering patients to self-manage flares. With longer follow-up, there is the potential for more admissions to be prevented with this strategy: observational data show that ULT associates with a significantly reduced risk of recurrent hospitalizations from 12 months after initiation, particularly when urate targets are attained [6]. Future work will help to determine whether primary care workload is also reduced following implementation of better hospital gout care.

Prior to implementation, only 10% of patients achieved a serum urate $\leq 360 \mu\text{mol/l}$ within 6 months of discharge. After implementation, urate target attainment more than doubled, to 26.8%. Despite this relative improvement, absolute levels of urate target attainment remained far below those seen in the Nottingham primary care trial (95% attainment by 12 months) [5]. Similarly, target attainment was below that reported in the BSR National Audit of outpatient gout management by UK rheumatologists (45% attainment by 12 months) [27], and only modestly better than what was reported in a UK-wide analysis of post-discharge gout care (1184/7040 [16.8%] patients attaining urate $\leq 360 \mu\text{mol/l}$ within 12 months of hospitalization [6]). There are several possible reasons for this. Follow-up in our study was relatively short at only 6 months. Patients in our study were all hospitalized for gout, and therefore are likely to represent a more severe cohort. Perhaps most importantly, in the Nottingham study there were an average of 17 study visits per participant over a 24-month period. In contrast, our gout follow-up clinic was delivered as a single telephone appointment, followed by handover of care to patients' primary care teams. Indeed, target attainment in our study was comparable to that seen in the usual care group of the Nottingham trial (26.8% *vs* 26.2%, respectively). Thus, our findings strongly suggest that our intervention, while effective at facilitating ULT initiation, is insufficient for the majority of people hospitalized for gout flares to achieve target urate levels.

There are several ways in which our intervention could be altered to promote urate target attainment. Rheumatologists could take greater ownership of hospitalized gout patients by providing outpatient follow-up until urate targets are achieved. Alternatively, training could be provided for healthcare professionals in primary care (e.g. nurses and/or pharmacists) to deliver optimal treat-to-target ULT, which was shown to be highly effective in the Nottingham study [5], NOR-Gout study [7] and many other studies [28, 29]. Strategies could be modelled on other integrated care services,

which proactively identify patients in hospital before transferring them to primary care-based pathways with secondary care support, such as fracture liaison services [30]. Future strategies should also encourage adherence to ULT, which although not assessed in our study, is often sub-optimal and may have contributed to our finding of infrequent urate target attainment despite high levels of ULT initiation [31]; this could incorporate patient education programmes, self-management tools and point-of-care urate testing [30].

A key strength of our study was the close involvement of stakeholders, patients and methodologists when developing our intervention and implementation strategy. Our intervention was based on best practice care from national and international gout management guidelines [8–11], and was modelled on the highly successful intervention used in the Nottingham primary care trial [5]. We adopted a multi-faceted implementation strategy to maximize intervention uptake. This incorporated several implementation strategies recommended in the ERIC guidance [17], including digital enablers, study champions, education sessions and clinician feedback. Adopting a multi-faceted strategy is particularly important when implementing complex interventions in healthcare settings. For example, an implementation strategy involving only educational sessions for clinicians in emergency departments may not succeed, given the challenges of reaching all frontline staff.

Our study also had limitations. Follow-up was only 6 months, which may have been too short to ascertain differences in post-discharge outcomes such as urate target attainment and recurrent hospitalizations. While the numerical reductions in re-hospitalizations we observed following implementation of our strategy might have been clinically meaningful, our study was underpowered to detect significant differences in these relatively rare events. Use of prophylaxis against flares whilst initiating/titrating ULT remained infrequent despite the intervention, particularly when compared with national data [27], and future studies should encourage the use of prophylaxis, given the benefits on flare reduction [8]. Data on comorbidities and other clinical outcomes (e.g. flare frequency or tophus burden) were unavailable. We included all hospitalizations where gout was deemed the likely diagnosis; crystal analysis and rheumatologist input were recommended, but not mandated. These pragmatic inclusion criteria reflect real-world clinical practice, although there remains a potential for diagnostic misclassification. Additionally, we utilized a retrospective comparator, rather than a prospective comparator. This was an a priori decision, to reflect resource availability and the service evaluation remit of this project; however, it is possible that some of the changes observed may represent changes in practice over time, rather than a direct result of the intervention (e.g. changes in service delivery during the COVID-19 pandemic). Our findings should therefore be seen as exploratory, rather than definitive. Finally, as our analyses were conducted at a single UK centre, the findings cannot be assumed to be generalizable to other healthcare settings.

In conclusion, after implementing a strategy designed to optimize care for people hospitalized with gout flares, >90% of patients were initiated on ULT. In the context of a single, nurse-led follow-up appointment, relative improvements in urate target attainment were observed; however, for the majority of hospitalized gout patients to achieve target urate levels, better in-hospital gout care needs to be accompanied by

strategies that embed and support optimization of ULT in primary care.

Supplementary material

Supplementary material is available at *Rheumatology* online.

Data availability

The data underlying this article cannot be shared publicly to ensure the privacy of individuals that participated in the study.

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References

1. Russell MD, Yates M, Bechman K *et al*. Rising incidence of acute hospital admissions due to gout. *J Rheumatol* 2020;47:619–23.
2. NHS Digital. Hospital Admitted Patient Care Activity. 2021. <https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity> (6 November 2023, date last accessed).
3. Lim SY, Lu N, Oza A *et al*. Trends in gout and rheumatoid arthritis hospitalizations in the United States, 1993–2011. *JAMA* 2016;315:2345–7.
4. Rai SK, Avina-Zubieta JA, McCormick N *et al*. Trends in gout and rheumatoid arthritis hospitalizations in Canada From 2000 to 2011. *Arthritis Care Res (Hoboken)* 2017;69:758–62.
5. Doherty M, Jenkins W, Richardson H *et al*. Efficacy and cost-effectiveness of nurse-led care involving education and engagement of patients and a treat-to-target urate-lowering strategy versus usual care for gout: a randomised controlled trial. *Lancet* 2018;392:1403–12.
6. Russell MD, Roddy E, Rutherford AI *et al*. Treat-to-target urate-lowering therapy and hospitalizations for gout: results from a nationwide cohort study in England. *Rheumatology* 2023;62:2426–34.
7. Uhlig T, Karoliussen LF, Sexton J *et al*. One- and 2-year flare rates after treat-to-target and tight-control therapy of gout: results from the NOR-Gout study. *Arthritis Res Ther* 2022;24:88.

8. Hui M, Carr A, Cameron S *et al.*; British Society for Rheumatology Standards, Audit and Guidelines Working Group. The British Society for Rheumatology Guideline for the Management of Gout. *Rheumatology (Oxford)* 2017;56:1246.
9. Richette P, Doherty M, Pascual E *et al.* 2016 updated EULAR evidence-based recommendations for the management of gout. *Ann Rheum Dis* 2017;76:29–42.
10. FitzGerald JD, Dalbeth N, Mikuls T *et al.* 2020 American College of Rheumatology Guideline for the Management of Gout. *Arthritis Care Res (Hoboken)* 2020;72:744–60.
11. NICE. Gout: diagnosis and management. 2022. <https://www.nice.org.uk/guidance/ng219> (6 November 2023, date last accessed).
12. Russell MD, Rutherford AI, Ellis B, Norton S *et al.* Management of gout following 2016/2017 European (EULAR) and British (BSR) guidelines: an interrupted time-series analysis in the United Kingdom. *Lancet Regional Health—Europe* 2022;18:100416.
13. Kuo CF, Grainge MJ, Mallen C, Zhang W, Doherty M. Rising burden of gout in the UK but continuing suboptimal management: a nationwide population study. *Ann Rheum Dis* 2015;74:661–7.
14. Abhishek A, Tata LJ, Mamas M, Avery AJ. Has the gout epidemic peaked in the UK? A nationwide cohort study using data from the Clinical Practice Research Datalink, from 1997 to across the COVID-19 pandemic in 2021. *Ann Rheum Dis* 2022;81:898–9.
15. Russell MD, Clarke BD, Roddy E, Galloway JB. Improving outcomes for patients hospitalized with gout: a systematic review. *Rheumatology (Oxford)* 2021;61:90–102.
16. Russell MD, Nagra D, Clarke BD *et al.* Hospitalizations for acute gout: process mapping the inpatient journey and identifying predictors of admission. *J Rheumatol* 2022;49:725–30.
17. Powell BJ, Waltz TJ, Chinman MJ *et al.* A refined compilation of implementation strategies: results from the Expert Recommendations for Implementing Change (ERIC) project. *Implement Sci* 2015;10:21.
18. NHS. Opt out of sharing your health records. 2023. <https://www.nhs.uk/using-the-nhs/about-the-nhs/opt-out-of-sharing-your-health-records/> (6 November 2023, date last accessed).
19. Kapadia A, Abhishek A. Inpatient rheumatology consultation for gout flares and advice to initiate urate lowering treatment (ULT) in hospital discharge summary increases ULT prescription in primary care. *Joint Bone Spine* 2019;86:271–2.
20. Kennedy NJ, Healy PJ, Harrison AA. Inpatient management of gout in a New Zealand hospital: a retrospective audit. *Int J Rheum Dis* 2016;19:205–10.
21. Sen M. SAT0443 Reconciliation of urate lowering therapies during hospitalization and the impact of rheumatologic consultation on management of inpatient gout flares. *Ann Rheum Dis* 2019;78:1310–1.
22. Wright S, Chapman PT, Frampton C *et al.* Management of Gout in a Hospital Setting: a Lost Opportunity. *J Rheumatol* 2017;44:1493–8.
23. Hill EM, Sky K, Sit M, Collamer A, Higgs J. Does starting allopurinol prolong acute treated gout? A randomized clinical trial. *J Clin Rheumatol* 2015;21:120–5.
24. Taylor TH, Mecchella JN, Larson RJ, Kerin KD, Mackenzie TA. Initiation of allopurinol at first medical contact for acute attacks of gout: a randomized clinical trial. *Am J Med* 2012;125:1126–34 e7.
25. Jia E, Zhang Y, Ma W *et al.* Initiation of febuxostat for acute gout flare does not prolong the current episode: a randomized clinical trial. *Rheumatology* 2021;60:4199–204.
26. Satpanich P, Pongsittisak W, Manavathongchai S. Early versus Late Allopurinol Initiation in Acute Gout Flare (ELAG): a randomized controlled trial. *Clin Rheumatol* 2022;41:213–21.
27. Roddy E, Packham J, Obrenovic K, Rivett A, Ledingham JM. Management of gout by UK rheumatologists: a British Society for Rheumatology national audit. *Rheumatology (Oxford)* 2018;57:826–30.
28. Goldfien RD, Ng MS, Yip G *et al.* Effectiveness of a pharmacist-based gout care management programme in a large integrated health plan: results from a pilot study. *BMJ Open* 2014;4:e003627.
29. Gill I, Dalbeth N, Ofanoa M, Goodyear-Smith F. Interventions to improve uptake of urate-lowering therapy in patients with gout: a systematic review. *BJGP Open* 2020;4:bjgpopen20X101051.
30. Royal Osteoporosis Society. Fracture Liaison Services. 2023. <https://theros.org.uk/healthcare-professionals/clinical-quality-hub/fracture-liaison-services/> (6 November 2023, date last accessed).
31. Perez-Ruiz F, Desideri G. Improving adherence to gout therapy: an expert review. *Ther Clin Risk Manag* 2018;14:793–802.

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Malignant or unspecified tumours Cases	0.2 n=15	0.2 n=50	0.2 n=225	0.3 n=422	0.3 n=520	0.3 n=573	0.3 n=1,896
MACE Cases	0.2 n=15	0.1 n=39	0.2 n=151	0.2 n=238	0.2 n=264	0.1 n=287	0.2 n=1,031
Total IBD Cases	0.2 n=12	0.2 n=46	0.2 n=185	0.3 n=340	0.2 n=312	0.1 n=261	0.2 n=1,291
Exposure (PY)	7450	28,549	93,744	137,325	182,024	212,636	680,470

No trend towards increased rates of malignancy, MACE or IBD over time⁶

The most frequently reported adverse reactions are upper respiratory tract infections (17.1%) (most frequently nasopharyngitis, rhinitis).^{1,2} Refer to the prescribing information for a summary of adverse events.

Adapted from Novartis Data on File. 2021.⁶

Refer to the Cosentyx Summary of Product Characteristics for full details, dosing and administration, including special populations.

Cosentyx® (secukinumab) licensed indications in rheumatology: Cosentyx, alone or in combination with methotrexate, is indicated for the treatment of active **psoriatic arthritis** in adult patients when the response to previous disease-modifying anti-rheumatic drug therapy has been inadequate; active **ankylosing spondylitis** in adults who have responded inadequately to conventional therapy; active **non-radiographic axial spondyloarthritis** with objective signs of inflammation as indicated by elevated C-reactive protein and/or magnetic resonance imaging evidence in adults who have responded inadequately to non-steroidal anti-inflammatory drugs; active **enthesitis-related arthritis** in patients 6 years and older (alone or in combination with methotrexate) whose disease has responded inadequately to, or who cannot tolerate conventional therapy; active **juvenile psoriatic arthritis** in patients 6 years or older (alone or in combination with methotrexate) whose disease has responded inadequately to, or who cannot tolerate, conventional therapy.^{1,2}

Prescribing information, adverse event reporting and full indication can be found on the next page.

*Patients prescribed Cosentyx for any indication since launch.

¹Successive time periods of PSUR shown with cumulative rate: 26 Dec 2014 to 25 Dec 2015; 26 Dec 2015 to 25 Dec 2016; 26 Dec 2016 to 25 Dec 2017; 26 Dec 2017 to 25 Dec 2018; 26 Dec 2018 to 25 Dec 2019; 26 Dec 2019 to 25 Dec 2020.⁶

Abbreviations: AE, adverse event; AS, ankylosing spondylitis; EAIR, exposure-adjusted incidence rate; HCP, healthcare professional; IBD, inflammatory bowel disease; MACE, major adverse cardiac event; PsA, psoriatic arthritis; PsO, plaque psoriasis; PY, patient year.

References: **1.** Cosentyx® (secukinumab) GB Summary of Product Characteristics; **2.** Cosentyx® (secukinumab) NI Summary of Product Characteristics; **3.** European Medicines Agency. European public assessment report. Available at: https://www.ema.europa.eu/en/documents/overview/cosentyx-epar-medicine-overview_en.pdf [Accessed February 2024]; **4.** Novartis Data on File. Secukinumab – Sec008. 2023; **5.** Novartis. Novartis Cosentyx® positive 16-week PREVENT results advance potential new indication for patients with axial spondyloarthritis. Available at: <https://www.novartis.com/news/media-releases/novartis-cosentyx-positive-16-week-prevent-results-advance-potential-new-indication-patients-axial-spondyloarthritis> [Accessed February 2024]; **6.** Novartis data on file. Cosentyx Periodic Safety Update Report (PSUR); 26 December 2019 – 25 December 2020. 22 February 2021; **7.** Deodhar A, et al. Arthritis Res Ther 2019;21(1):111.



Cosentyx® (secukinumab) Northern Ireland Prescribing Information.

Please refer to the Summary of Product Characteristics (SmPC) before prescribing.

Indications: Treatment of: moderate to severe plaque psoriasis in adults, children and adolescents from the age of 6 years who are candidates for systemic therapy; active psoriatic arthritis in adults (alone or in combination with methotrexate) who have responded inadequately to disease-modifying anti-rheumatic drug therapy; active ankylosing spondylitis in adults who have responded inadequately to conventional therapy; active non-radiographic axial spondyloarthritis (nr-axSpA) with objective signs of inflammation as indicated by elevated C-reactive protein (CRP) and/or magnetic resonance imaging (MRI) evidence in adults who have responded inadequately to non-steroidal anti-inflammatory drugs; active enthesitis-related arthritis and juvenile psoriatic arthritis in patients 6 years and older (alone or in combination with methotrexate) whose disease has responded inadequately to, or who cannot tolerate, conventional therapy; active moderate to severe hidradenitis suppurativa (acne inversa) in adults with an inadequate response to conventional systemic HS therapy. **Presentations:** Cosentyx 150 mg solution for injection in pre-filled pen; Cosentyx 300 mg solution for injection in pre-filled pen. **Dosage & Administration:** Administered by subcutaneous injection at weeks 0, 1, 2, 3 and 4, followed by monthly maintenance dosing. Consider discontinuation if no response after 16 weeks of treatment. Each 150 mg dose is given as one injection of 150 mg. Each 300 mg dose is given as two injections of 150 mg or one injection of 300 mg. If possible avoid areas of the skin showing psoriasis. **Plaque Psoriasis:** Adult recommended dose is 300 mg monthly. Based on clinical response, a maintenance dose of 300 mg every 2 weeks may provide additional benefit for patients with a body weight of 90 kg or higher. Adolescents and children from the age of 6 years: if weight ≥ 50 kg, recommended dose is 150 mg (may be increased to 300 mg as some patients may derive additional benefit from the higher dose). If weight < 50 kg, recommended dose is 75 mg. However, 150mg solution for injection in pre-filled pen is not indicated for administration of this dose and no suitable alternative formulation is available. **Psoriatic Arthritis:** For patients with concomitant moderate to severe plaque psoriasis see adult plaque psoriasis recommendation. For patients who are anti-TNF α inadequate responders, the recommended dose is 300 mg, 150 mg in other patients. Can be increased to 300 mg based on clinical response. **Ankylosing Spondylitis:** Recommended dose 150 mg. Can be increased to 300 mg based on clinical response. **nr-axSpA:** Recommended dose 150 mg. **Enthesitis-related arthritis and juvenile psoriatic arthritis:** From the age of 6 years, if weight ≥ 50 kg, recommended dose is 150 mg. If weight < 50 kg, recommended dose is 75 mg.

Cosentyx® (secukinumab) Great Britain Prescribing Information.

Please refer to the Summary of Product Characteristics (SmPC) before prescribing.

Indications: Treatment of: moderate to severe plaque psoriasis in adults, children and adolescents from the age of 6 years who are candidates for systemic therapy; active psoriatic arthritis in adults (alone or in combination with methotrexate) who have responded inadequately to disease-modifying anti-rheumatic drug therapy; active ankylosing spondylitis in adults who have responded inadequately to conventional therapy; active non-radiographic axial spondyloarthritis (nr-axSpA) with objective signs of inflammation as indicated by elevated C-reactive protein (CRP) and/or magnetic resonance imaging (MRI) evidence in adults who have responded inadequately to non-steroidal anti-inflammatory drugs; active enthesitis-related arthritis and juvenile psoriatic arthritis in patients 6 years and older (alone or in combination with methotrexate) whose disease has responded inadequately to, or who cannot tolerate, conventional therapy; active moderate to severe hidradenitis suppurativa (acne inversa) in adults with an inadequate response to conventional systemic HS therapy. **Presentations:** Cosentyx 75 mg solution for injection in pre-filled syringe; Cosentyx 150 mg solution for injection in pre-filled syringe; Cosentyx 150 mg solution for injection in pre-filled pen; Cosentyx 300 mg solution for injection in pre-filled pen. **Dosage & Administration:** Administered by subcutaneous injection at weeks 0, 1, 2, 3 and 4, followed by monthly maintenance dosing. Consider discontinuation if no response after 16 weeks of treatment. Each 75 mg dose is given as one injection of 75 mg. Each 150 mg dose is given as one injection of 150 mg. Each 300 mg dose is given as two injections of 150 mg or one injection of 300 mg. If possible avoid areas of the skin showing psoriasis. **Plaque Psoriasis:** Adult recommended dose is 300 mg. Based on clinical response, a maintenance dose of 300 mg every 2 weeks may provide additional benefit for patients with a body weight of 90 kg or higher. Adolescents and children from the age of 6 years: if weight ≥ 50 kg, recommended dose is 150 mg (may be increased to 300 mg as some patients may derive additional benefit from the higher dose). If weight < 50 kg, recommended dose is 75 mg. **Psoriatic Arthritis:** For patients with concomitant moderate to severe plaque psoriasis see adult plaque psoriasis recommendation. For patients who are anti-TNF α inadequate responders, the recommended dose is 300 mg, 150 mg in other patients. Can be increased to 300 mg based on clinical response. **Ankylosing Spondylitis:** Recommended dose 150 mg. Can be increased to 300 mg based on clinical response. **nr-axSpA:** Recommended dose 150 mg. **Enthesitis-related arthritis and juvenile psoriatic arthritis:** From the age of 6 years, if weight ≥ 50 kg, recommended dose is 150 mg. If

weight < 50 kg, recommended dose is 75 mg. **Hidradenitis suppurativa:** Recommended dose is 300 mg monthly. Based on clinical response, the maintenance dose can be increased to 300 mg every 2 weeks. **Contraindications:** Hypersensitivity to the active substance or excipients. Clinically important, active infection. **Warnings & Precautions:** Infections: Potential to increase risk of infections; serious infections have been observed. Caution in patients with chronic infection or history of recurrent infection. Advise patients to seek medical advice if signs/symptoms of infection occur. Monitor patients with serious infection closely and do not administer Cosentyx until the infection resolves. Non-serious mucocutaneous candida infections were more frequently reported for secukinumab than placebo in the psoriasis clinical studies. Should not be given to patients with active tuberculosis (TB). Consider anti-tuberculosis therapy before starting Cosentyx in patients with latent TB. **Inflammatory bowel disease (including Crohn's disease and ulcerative colitis):** New cases or exacerbations of inflammatory bowel disease have been reported with secukinumab. Secukinumab, is not recommended in patients with inflammatory bowel disease. If a patient develops signs and symptoms of inflammatory bowel disease or experiences an exacerbation of pre-existing inflammatory bowel disease, secukinumab should be discontinued and appropriate medical management should be initiated. **Hypersensitivity reactions:** Rare cases of anaphylactic reactions have been observed. If an anaphylactic or serious allergic reactions occur, discontinue immediately and initiate appropriate therapy. **Vaccinations:** Do not give live vaccines concurrently with Cosentyx; inactivated or non-live vaccinations may be given. Paediatric patients should receive all age appropriate immunisations before treatment with Cosentyx. **Latex-Sensitive Individuals:** The removable needle cap of the 150mg pre-filled pen contains a derivative of natural rubber latex. **Concomitant immunosuppressive therapy:** Combination with immunosuppressants, including biologics, or phototherapy has not been evaluated in psoriasis studies. Cosentyx was given concomitantly with methotrexate, sulfasalazine and/or corticosteroids in arthritis studies. Caution when considering concomitant use of other immunosuppressants. **Interactions:** Live vaccines should not be given concurrently with secukinumab. No interaction between Cosentyx and midazolam (CYP3A4 substrate) seen in adult psoriasis study. No interaction between Cosentyx and methotrexate and/or corticosteroids seen in arthritis studies. **Fertility, pregnancy and lactation:** **Women of childbearing potential:** Use an effective method of contraception during and for at least 20 weeks after treatment. **Pregnancy:** Preferably avoid use of Cosentyx in pregnancy. **Breast feeding:** It is not known if secukinumab is excreted in human breast milk. A clinical decision should be made on continuation of breast feeding during Cosentyx treatment (and up to 20 weeks after

discontinuation) based on benefit of breast feeding to the child and benefit of Cosentyx therapy to the woman. **Fertility:** Effect on human fertility not evaluated. **Adverse Reactions:** Very Common ($\geq 1/10$): Upper respiratory tract infection. Common ($\geq 1/100$ to $< 1/10$): Oral herpes, headache, rhinorrhoea, diarrhoea, nausea, fatigue. Uncommon ($\geq 1/1,000$ to $< 1/100$): Oral candidiasis, lower respiratory tract infections, neutropenia, inflammatory bowel disease. Rare ($\geq 1/10,000$ to $< 1/1,000$): anaphylactic reactions, exfoliative dermatitis (psoriasis patients), hypersensitivity vasculitis. **Not known:** Mucosal and cutaneous candidiasis (including oesophageal candidiasis). **Infections:** Most infections were non-serious and mild to moderate upper respiratory tract infections, e.g. nasopharyngitis, and did not necessitate treatment discontinuation. There was an increase in mucosal and cutaneous (including oesophageal) candidiasis, but cases were mild or moderate in severity, non-serious, responsive to standard treatment and did not necessitate treatment discontinuation. Serious infections occurred in a small proportion of patients (0.015 serious infections reported per patient year of follow up). **Neutropenia:** Neutropenia was more frequent with secukinumab than placebo, but most cases were mild, transient and reversible. Rare cases of neutropenia CTCAE Grade 4 were reported. **Hypersensitivity reactions:** Urticaria and rare cases of anaphylactic reactions were seen. **Immunogenicity:** Less than 1% of patients treated with Cosentyx developed antibodies to secukinumab up to 52 weeks of treatment. **Other Adverse Effects:** The list of adverse events is not exhaustive, please consult the SmPC for a detailed listing of all adverse events before prescribing. **Legal Category:** POM. **MA Number & List Price:** PLGB 00101/1205 – 75 mg pre-filled syringe x 1 - £304.70; PLGB 00101/1029 – 150 mg pre-filled pen x2 £1,218.78; PLGB 00101/1030 – 150 mg pre-filled syringe x2 £1,218.78; PLGB 00101/1198 – 300 mg pre-filled pen x 1 £1218.78. **PI Last Revised:** June 2023. Full prescribing information, (SmPC) is available from: Novartis Pharmaceuticals UK Limited, 2nd Floor, The WestWorks Building, White City Place, 195 Wood Lane, London, W12 7FQ. Telephone: (01276) 692255.

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