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ORIGINAL RESEARCH

Optimising gout treatment: insights from a nurse-led cohort study

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ABSTRACT

Objectives Currently, gout management, particularly urate-lowering therapy (ULT), is often suboptimal. Nurses successfully manage various diseases including gout. As gout prevalence is rising, and rheumatologists and general practitioners face shortages, a new approach is imperative. This real-life prospective cohort study evaluated the effectiveness of nurse-led care employing a treat-to-target strategy for gout management over a 2-year period.

Methods All consecutively confirmed gout patients were included. The nurse-led clinic provided a structured treatment plan with consultations, patient leaflets, telephone contacts and laboratory monitoring. After a year of nurse-led care, patients transitioned to continued care in general practice. Follow-up data were complete through registries. The primary outcome was achieving target p-urate levels (<0.36 mmol/L) at 2 years after diagnosis. Secondary outcomes included treatment continuation and achievement of target p-urate levels in specific subgroups. The results were compared with patients diagnosed in the same clinic but followed up in 'usual care'.

Results In the nurse-led group (n=114), 83% achieved target p-urate levels and ULT was continued by 98%. This trend persisted across various patient subgroups. Only 44% of patients in usual care achieved target p-urate and with insufficient doses of allopurinol . Nurse-led care involved an average of two visits and three telephone contacts over 336 days. The 2-year mortality rate was 15%.

Conclusions Nurse-led gout care, employing a targeted approach, was associated with a very high uptake of and adherence to ULT. The encouraging results were not achieved in usual care although a direct comparison might be influenced by selection bias.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Gout is a prevalent global inflammatory arthritis associated with reduced quality of life, comorbidities and increased mortality rates. Guidelines recommend a treat-to-target strategy to maintain low plasma urate (p-urate) levels (<6 mg/dL or <0.36 mmol/L), but studies indicate suboptimal treatment. Successful nurse-led gout care has been demonstrated in Nottingham, UK, but its reproducibility and success in diverse settings are uncertain.

WHAT THIS STUDY ADDS

⇒ Nurse-led gout care, characterised by targeted strategies, achieved excellent results in this intervention. Patient education, engagement and a dedicated transition to long-term general practice care were highlighted as important. With an average of two visits and three telephone contacts over 336 days before transitioning, nurse-led care achieved an 82% target p-urate level at the 2-year follow-up, consistently observed across patient subgroups. Urate-lowering therapy (ULT) was continued in 98% of the nurse-led group. In contrast, patients in usual care achieved target p-urate levels in only 44%, with ULT continuation at 73%, although with lower allopurinol doses (235 vs 308 mg/day).

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our approach, which did not require informed consent and included complete routine follow-up, allowed for the inclusion and evaluation of a broader, more representative patient group. Despite fewer nurse consultations, our results align with those from Nottingham, confirming the effectiveness of nurse-led care.

⇒ The observed overall 2-year mortality rate of 15% emphasises the need for special attention to patients diagnosed with gout by microscopy, highlighting the effectiveness of nurse-led care. While our study design may have introduced some selection bias, we took measures to minimise it when comparing with usual care. We believe our study provides a true representation of affordable real-life clinical settings.

INTRODUCTION

Gout, the most prevalent inflammatory arthritis worldwide, is on the rise.[1–4] The condition is associated with reduced quality of life, comorbidities and increased mortality rates.[5 6]

To address the suboptimal treatment outcomes in gout management, recent guidelines have emphasised the importance of the treat-to-target strategy, focusing on reducing tissue urate crystal deposition steadily.[7 8] Lifelong maintenance of a low plasma urate (p-urate) level (<6 mg/dL or <0.36 mmol/L)

has been emphasised, with even lower targets (<5 mg/dL or 0.30 mmol/L) recommended for patients with severe gout (eg, tophi, chronic arthropathy and frequent attacks).

Despite the clear recommendations for urate-lowering therapy (ULT) in patients with established gout, studies in both primary and secondary care have revealed that less than half of the patients receive ULT, and when prescribed, the doses are often fixed without appropriate titration to achieve target plasma urate concentrations.[9–11] Additionally, treatment adherence has been shown poor.[12 13]

In a previous cross-sectional study, we assessed the treatment of patients with confirmed gout in mixed real-life settings, including rheumatology clinics, emergency wards, other specialties and general practice (GP).[11] The overall results after 2 years showed poor adherence to recommended p-urate targets, prompting us to seek solutions to improve patient care. A preliminary study indicated that nurse-led care outperformed GP care, a finding later supported by a randomised study.[14 15] Based on these findings, we established a nurse-led clinic in 2017 and planned to evaluate its outcomes after a 2-year follow-up, including the 1-year period after transfer from hospital-based nurse-led care back to GP care.

In this real-life prospective cohort study, our objective was to evaluate whether an initial phase of nurse-led care, using a treat-to-target strategy for gout confirmed by microscopy, demonstrated superior outcomes in achieving target p-urate levels compared with the standard 'treatment as usual', assessed 2 years after the diagnosis of gout by microscopy.

MATERIAL AND METHODS

Setting, diagnosis and patients

This prospective cohort study was conducted at the Clinic of Rheumatology, North Denmark Regional Hospital, serving a population of 290 000 individuals. The clinic's microscopy service provided joint fluid or tophaceous material examination for crystals for the entire hospital and its catchment area. Patients were referred to the microscopy service by GPs or were examined during their care in other hospital departments. Joint or tophus punctures were performed in the outpatient clinic by rheumatologists, with a few specimens sent from orthopaedic surgeons or cardiologists. All microscopy results, including date and puncture site, were recorded in a local logbook and/or electronically in the Patient Administrative System using procedure codes (ZZ2300 or ZZ5300).

After a diagnosis of gout is confirmed by microscopy, patients could be returned to the care of their GPs, their respective referring hospital departments, or offered additional follow-up consultations in the rheumatology clinic (conducted by physicians). After the establishment of nurse-led care in the middle of the study period, patients could also be referred to this intervention by the referring physician who received the microscopy result. After establishment of nurse-led care, there were no mechanisms in place to ensure consistent provision of information regarding long-term follow-up in the nurse-led clinic or elsewhere, alongside the microscopy results. The microscopy results could simply indicate whether crystals were detected (yes/no) or be accompanied by a brief explanation focusing on the treatment of the actual flare.

The study comprised a consecutive cohort of patients diagnosed in the clinic with gout by microscopy in the period 4 February 2015 to 1 June 2021 and with follow-up 24 months after date of microscopy. The urate crystal findings were manually verified in each patient's file. Baseline information was collected from patients' medical records (table 1). All prescribed treatments regarding ULT were confirmed in the national database, Shared Medicine Card (danishhealthdata.com). At baseline, a prescribed ULT (after 2009) was regarded as ongoing even if it was discontinued or not. At 2 years follow-up, both the dose and redeemed prescriptions for ULT were confirmed. Vital status was retrieved from the civil registry. All Danish citizens are assigned a unique ID number, which allows us to access patient information across all registries and IT systems. Informed consent was not required, and thus all eligible patients participated in the study, including follow-up for all patients who survived the first year.

Nurse-led gout clinic

The nurse-led gout clinic was established as a subunit within the Clinic of Rheumatology on 20 June 2017. Following this date, patients diagnosed with gout had the option to be referred to either nurse-led care or usual care, based on the discretion of the physician who received the microscopy results. The decision took into account the patient's willingness and ability to attend the nurse-led clinic if offered this care. However, we did not have control over how or which patients were offered nurse-led care after puncture and microscopy. Referral to nurse-led care was not considered participation in a clinical study requiring special consent. Patients with malignant diseases or severe kidney diseases were accepted for nurse-led care. A senior rheumatologist in the clinic assessed the referral to nurse-led care and supplemented the standard treatment plan when appropriate.

The nurse-led group consisted of patients diagnosed between 20 June 2017 and 1 June 2021, and treated within this subunit. Patients who had at least one visit or telephone contact with the nurse-led clinic were assigned to the nurse-led cohort, regardless of subsequent contacts. Nurses received specialised training in gout management, focusing on overcoming known barriers to treatment.[11 16] A structured treatment plan was developed, comprising consultations, provision of a patient leaflet, telephone contacts, allopurinol titration and laboratory monitoring. After a scheduled series of eight contacts over 1 year, patient care was transferred back to their GP's with a detailed letter advocating lifelong ULT and annual checks of p-urate level. Due to the COVID-19

Table 1 Baseline characteristics of all 286 patients with gout diagnosed by microscopy between 4 February 2015 and 1 June 2021

Period microscopy performed	20 June 2017–1 June 2021	4 February 2015–1 June 2021
Setting	Nurse-led care	Usual care
All patients baseline n	114	172
Age years median (range) all	69 (31–90)	70 (20–98)
Males years median (range)	67 (31–90)	68 (20–93)
Females years median (range)	73 (60–87)	76 (32–98)
Age >70 years n (%)	51 (45)	84 (49)
Male gender n (%)	98 (86)	130 (76)
Tophi present n (%)	49 (43)	62 (36)
Ongoing ULT n (%)	22 (19)	31 (18)
eGFR mmoL/min/1,73 m^2 median (range)	71 (5–137)	63 (14–132)
eGFR<60 mL/min=CKD gr. 3 n (%)	39 (34)	74 (44)
Hypertension n (%)	68 (60)	113 (66)
Atrial fibrillation and/or IHD n (%)	40 (35)	77 (45)
Diabetes n (%)	26 (23)	23 (13)
Use of diuretics n (%)	38 (33)	81 (47)
Cancer diagnosis at baseline n (%)	12 (11)	9 (5)
p-urate mmol/L median (range)	0.56 (0.36–0.83)	0.53 (0.23–0.98)
Not measured n	0	6
p-urate>0.50 mmol n (%)	83 (73)	104 (60)
Referred to microscopy from other hospital clinics n (%)	21 (18)	53 (31)
Anatomical puncture site		
Knee n (%)	34 (30)	75 (44)
Ankle n (%)	22 (19)	20 (12)
Elbow n (%)	3 (3)	3 (2)
Wrist n (%)	2 (2)	9 (5)
Tophus-finger-toe n (%)	50 (44)	65 (38)

Nurse-led care was established 20 June 2017. Data are median (range) or absolute numbers (%).
CKD gr. 3, chronic kidney disease grade 3; eGFR, estimated glomerular filtration rate; IHD, ischaemic heart disease; ULT, urate-lowering therapy.

pandemic from March 2020 to September 2021, several visits were replaced with telephone contacts. The nurses had access to rheumatologist advice for any gout management queries. All patient contacts were recorded in the hospital file and the national clinical database, Danbio-online.dk.

Allopurinol was the primary choice of treatment for most patients, typically starting at a daily dose of 100 mg and gradually titrating to reach the target p-urate concentration. During the study, we commonly treated flares and provided temporary prophylaxis using colchicine in agreement with the national guideline valid for the whole study period.[8 17] The Danish guideline from 2015 was like European Alliance of Associations for Rheumatology 2016 guideline with regard to management and target p-urate.[7] To ensure consistent and clear information delivery, the orally provided instructions in the nurse-led clinic aligned with the clinic's patient gout leaflet available since 2012 with an update 2017 coauthored with experienced nurses and incorporating feedback from the clinic's Patient Advisory Board.

Recognising that nearly all patients would ultimately transition to long-term care provided by their general practitioner, we dedicated special attention to the transfer process from the nurse-led care after this intervention was established.[18] During the last visit, patients were given a detailed letter outlining the individual treatment continuation plan with their GP (online supplemental file 2). Additionally, we sent a discharge letter, jointly authored with the local GP's representative, which provided guidance on future monitoring and treatment, along with contact information for the rheumatology hotline service in case of any issues (online supplemental file 1).

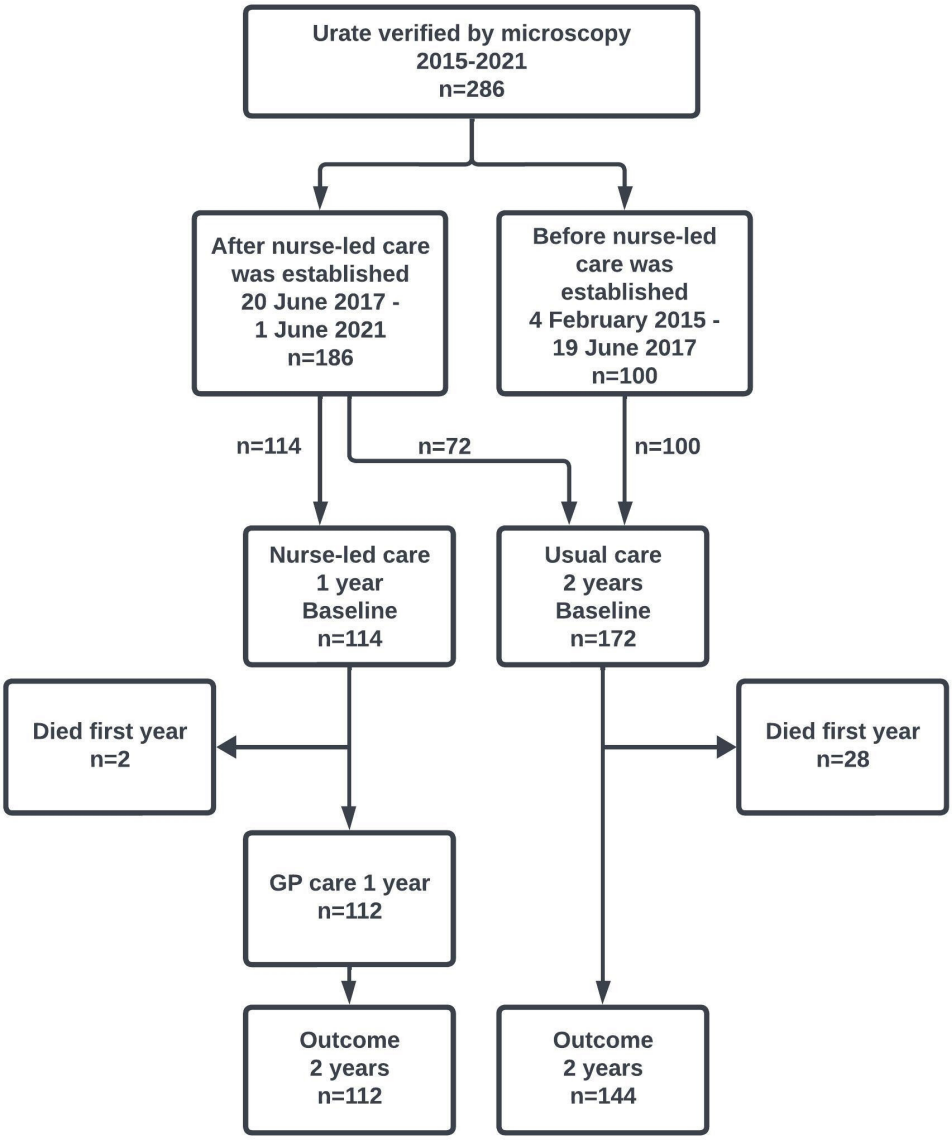

Figure 1 Flow chart illustrating the study participants from the date of microscopy confirming gout. Follow-up assessments were conducted 2 years after the date of microscopy. Nurse-led care was established on 20 June 2017. GP, general practice.

Usual care

After receiving the microscopy results, the requesting physician had the option to return the patient to the care of their GPs or offer additional follow-up consultations in the rheumatology clinic, conducted by physicians. The physician could also refer the patient to nurse-led care after it was established, but there was no mechanism in place to ensure this was consistently done. Patients who were receiving care in other departments at the time of microscopy relied on treatment and referrals from those departments, including orthopaedic surgery, emergency wards or internal medicine, which were responsible for sending discharge letters to GPs regarding gout follow-up treatment. Patients in the usual care cohort received standard care either in GP or in other hospital departments, including the rheumatology clinic, conducted by physicians.

The 'usual care' group consisted of all patients diagnosed from 4 February 2015 to 1 June 2021 but not seen in the nurse-led clinic (figure 1). No patients with urate crystals were excluded, including those with malignant diseases or severe kidney disease.

Outcome

The primary outcome measure assessed the percentage of patients who achieved p-urate <0.36 mmol/L (6 mg/dL) 2 years after the microscopy. Secondary outcome measures included the percentage of patients who continued ULT at the 2-year mark and the percentage of patients with tophi who achieved p-urate <0.3 mmol/L.

Outcomes were assessed only in patients who survived the first year after microscopy to allow time for treatment delay, dose titration, exclusion of terminal sick patients unable to visit nurse-led care and transfer to GP care. For patients who died between 12 and 24 months, the latest

monitored p-urate level after 12 months was considered the 2-year outcome. For patients in ULT, but without monitored p-urate at 2 years, the percentage of p-urate <0.36 mmol/L was extrapolated based on the other patients with measured p-urate and treated with the same dose of ULT. For patients with neither ongoing ULT nor measured p-urate, the urate levels at 2 years were assessed ≥0.36 mmol/L. Mortality was not considered as a predefined outcome but a relevant measure to address in results and discussion.

Statistics

Categorical data were compared using the χ^2 test or Fisher's exact test, and continuous data were compared using the Mann-Whitney test. The significance level was set at 5%. The analyses were conducted using the https://www.socscistatistics.com website (accessed in July 2023). Absolute event rates over a 2-year period were computed for both groups, and the relative risk (RR) reduction with CI 95% was determined using the MedCalc Software's Comparison of Two Rates tool: https://www.medcalc.org/calc/rate_comparison.php (V.22.009; accessed in November 2023).

RESULTS

From 4 February 2015 to 1 June 2021, we diagnosed 286 patients with urate crystals. 100 of these were diagnosed prior to the establishment of the nurse-led clinic leaving 186 patients diagnosed in the life time of this clinic. 114 received care in this nurse-led clinic leaving 72 plus 100=172 in the usual care group (table 1 and figure 1).

The outcome was assessed in the patients who survived the first year: 112 in the nurse-led group and 58+86=144 in the usual care group, as shown in tables 2 and 3. 13 patients died between 12 and 24 months. The primary outcome measure, p-urate <0.36 mmol/L, was reached by 82% (92/112) in the nurse-led group compared with 44% (63/144) in usual care (95% CI 1.88 1.35 to 2.63, p=0.0001) (table 4). ULT was continued in 98% of the nurse-led group and 73% of the usual care group (RR 1.35 (95% CI 1.02 to 1.78), p=0.03, table 4). Within the

Table 2 Baseline characteristics of all 256 (90%) patients who survived first year and thus were included in the comparison of outcome at 2 years

Period microscopy performed	20 June 2017–1 June 2021	4 February 2015–1 June 2021
Setting	Nurse-led care	Usual care
Number alive after 1 year n (%)	112 (98%)	144 (84%)
Age years median (range) all	69 (31–90)	68 (20–98)
Males years median (range)	67 (31–90)	68 (20–93)
Females years median (range)	73 (60–87)	74 (32–98)
Age >70 years n (%)	49 (44%)	62 (43%)
Male gender n (%)	96 (86%)	115 (80%)
Tophi present n (%)	48 (43%)	40 (28%)
Ongoing ULT n (%)	21 (19%)	26 (18%)
eGFR<60 mL/min=CKD gr. 3 n (%)	37 (33%)	56 (39%)
Hypertension n (%)	66 (59%)	92 (64%)
Atrial fibrillation and/or IHD n (%)	38 (34%)	59 (41%)
Diabetes n (%)	26 (23%)	17 (12%)
Use of diuretics n (%)	37 (33%)	63 (44%)
Cancer diagnosis at baseline n (%)	12 (11%)	3 (2%)
p-urate>0.50 mmol/L n (%)	81 (72%)	84 (58%)
Referred from other hospital clinics n (%)	21 (19%)	39 (27%)
Anatomical puncture site		
Knee n (%)	33 (29%)	64 (44%)
Ankle n (%)	22 (20%)	16 (11%)
Elbow n (%)	3 (3%)	3 (2%)
Wrist n (%)	2 (2%)	8 (4%)
Tophus-finger-toe n (%)	49 (44%)	54 (47%)

Data are median (range) or absolute numbers (%). Nurse-led care was established 20 June 2017.
CKD gr. 3, chronic kidney disease grade 3; eGFR, estimated glomerular filtration rate; IHD, ischaemic heart disease; ULT, urate-lowering therapy.

Table 3 Dichotomous efficacy outcomes at 2 years for all patients and for subgroups

Baseline N	Nurse led n=114	Usual care n=172	
2 years, n	Nurse led n=112	Usual care n=144	Risk ratio (95% CI)
Primary outcome: p-urate<0.36 mmol/L—all patients			
Baseline n (%)	0 (0%)	12 (7%)	0.00 (0.00 to 0.54)
2 years n (%)	92 (82%)	63 (44%)	1.88 (1.35 to 2.63)
p-urate<0.36 mmol/L for patients age >70 years			
Baseline n (%)	0 (0%)	4 (5%)	0.00 (0.00 to 2.41)
2 years n (%)	41 (84%)	28 (45%)	1.85 (1.12 to 3.11)
p-urate<0.36 mmol/L for patients eGFR<60 mL/min/1.73 m^2			
Baseline n (%)	0 (0%)	0 (0%)	0.00 (0 to 0.09)
2 years n (%)	31 (84%)	29 (52%)	1.62 (0.94 to 2.78)
p-urate<0.36 mmol/L for patients p-urat>0.50 mmol/L at baseline			
Baseline (p-urate>0.50 mmol/ baseline)	83 (73%)	104 (60%)	1.20 (0.89 to 1.62)
2 years n (%)	68 (84%)	37 (44%)	1.91 (1.26 to 2.93)
p-urate<0.36 mmol/L for female patients			
Baseline n (%)	0 (0%)	4 (10%)	0.00 (0.00 to 3.98)
2 years n (%)	15 (94%)	14 (48%)	1.94 (0.87 to 4.34)
p-urate<0.36 mmol/L by use of diuretics			
Baseline n (%)	0 (0%)	2 (2%)	0.00 (0.00 to 11.4)
2 years n (%)	33 (89%)	33 (52%)	1.70 (1.02 to 2.85)
p-urate<0.30 mmol/L for patients with tophi			
Baseline n (%)	0 (0%)	1 (2%)	0.00 (0.00 to 41.4)
2 years n (%)	29 (60%)	13 (33%)	1.86 (0.94 to 3.90)
Ongoing urate-lowering therapy			
Baseline n (%)	22 (19%)	31 (18%)	1.07 (0.59 to 1.91)
2 years n (%)	110 (98%)	105 (73%)	1.35 (1.02 to 1.78)

At 2 years assessment, we have excluded all 30 patients who died the first year. CI indicates 95% CI for incidence rate ratio.
eGFR, estimated glomerular filtration rate.

nurse-led group, 90% (101/112) received treatment with allopurinol, with an average daily dosage of 308 mg. In contrast, in the usual care group, 67% (97/144) received this treatment, and the mean daily dosage allopurinol administered was 235 mg (table 4). No cases of allopurinol hypersensitivity syndrome were observed. Febuxostat/probenecid was used by 8/1 in the nurse-led group and 7/2 in usual care.

The measurement of p-urate at 2 year was missing for 4% (4/112) in the nurse-led group and 30% (43/144) in the usual care. Based on the dose of ongoing allopurinol treatment in 23 of those 47 patients, we could extrapolate the p-urate value for all patients at 2 years (table 4).

The median time from microscopy to the first visit in the nurse-led clinic was 37 days, and the intervention consisted of a median of 2 visits and three telephone contacts over 336 days.

A diagnosis of cancer was present at baseline in 12 (11%) in nurse-led care compared with 9 (5%) in usual care. After 1 year, 0 of those died in the nurse-led care and 3 in the usual care and after 2 years 1 and 7, respectively.

The 2-year mortality rate was 4% (4/114) in the nurse-led group compared with 23% (39/172) in the usual care group (95% CI 0.1547 (0.04 to 0.43), p<0.0001).

DISCUSSION

Our study showed that in a cohort of patients with confirmed gout, 82% maintained target p-urate levels 1 year after completing the intervention in the 1-year nurse-led clinic. In contrast, only 44% of patients in the usual care group achieved p-urate levels <0.36 mmol/L after 2 years.

In the nurse-led group, ULT was continued in 98% of patients vs 73% in usual care, although with lower allopurinol doses. The encouraging results in the nurse-led group were also found in patients with age >70 years, impaired renal function, tophi, females, p-urate >0.50 mmol/L and use of diuretics. At the 2 years follow-up, nearly all patients had been cared for the second year in GP, indicating that the transfer process from the nurse-led clinic to GP was effective.

Table 4 Comparison of patients at 2 years follow-up for 256 (90%) of patients who survived first year

Patients at 2 years follow-up	Nurse led n=112	Usual care n=144
All patients n	112	144
Measured p-urate <0.36 mmol/L n (%)	89 (79%)	54 (38%)
Measured p-urate ≥0.36 mmol/L n	19	47
Not measured p-urate n	4	43
Patients without measured p-urate at 2 years n	4	43
Ongoing ULT n	4	19
Dose allopurinol mg/day mean	309	242
No ongoing ULT n	0	24
Ongoing ULT and measured p-urate at 2 years n	110	113
p-urate <0.36 mmol/L n (%)	89/110=81%	53/113=47%
All patients with and without measured p-urate at 2 years n	112	144
urate <0.36 mmol/L excluding extrapolated n	89	54
Extrapolated to p-urate <0.36 mmol/l n	81% of 4=3	47% of 19=9
p-urate <0.36 mmol/L including extrapolated n (%)	89+3=92 (82%)	54+9=63 (44%)
ULT all types n (%)	110 (98%)	105 (73%)
Allopurinol n (%)	101 (92%)	96 (67%)
Allopurinol mg/day mean	308	235
Febuxostat n (%)	8	7
Probenecid n (%)	1	2
No ULT n (%)	2 (2%)	39 (27%)
Mortality (all 286 patients at baseline)	114	172
Number died <1 years n (%)	2 (2%)	28 (16%)
Males n (%)	2 (2%)	15 (12%)
Females n (%)	0 (0%)	13 (31%)
Died <1 year and cancer at baseline n (%)	0 (0%)	6 (3%)
Number died <2 years n (%)	4 (4%)	39 (23%)
Males n (%)	4 (4%)	23 (18%)
Females n (%)	0 (0%)	16 (38%)
Died <2 years and cancer at baseline n (%)	1 (1%)	7 (4%)

Extrapolation of p-urate <0.36 mmol/L was based on known dose of allopurinol. Mortality figures are stated for all 286 patients included at baseline.
ULT, urate-lowering-therapy.

This study strongly reaffirms the importance of education and engagement of patients in disease management, the usefulness of a treat-to-target strategy and collaborative involvement of GPs in long-term care.

While acknowledging the selection bias inherent in our study outline, where certain patient characteristics may influence group assignment, we believe it is essential to compare these two groups due to the absence of alternative comparison groups. Despite the potential for bias, examining the differences between these groups provides valuable insights into treatment efficacy. While we recognise the risk of drawing inaccurate conclusions, conducting this comparison allows us to explore potential associations and trends that may guide future research and clinical practice. We have taken steps to mitigate bias where possible and have conducted thorough analyses to interpret the results with caution (tables 3 and 4).

The study was approved as a quality assurance study, ensuring that all eligible patients were included, with complete follow-up at 2 years for the 90% who survived the first year.

Referral to the nurse-led clinic depended on the information conveyed along with the microscopy result. This included the physician's awareness of nurse-led care, their attitude towards nurse-led care and the patient's ability or willingness to travel to visits up to 150 km from their residence. Physicians outside the rheumatology clinic who requested microscopy were not consistently informed about the availability of nurse-led care along with the microscopy results. The lack of consistent information, together with comorbidities, may

explain why some eligible patients in other hospital clinics were not referred to nurse-led care. Even within the rheumatology clinic, there may have been barriers to referring patients to the subunit nurse-led clinic. Most patients were urgently scheduled for punctures in a hectic work schedule, which might discourage a referral to nurse-led care. This contrasts with simply conveying the microscopy findings directly to the referring physician. However, the selection criteria for microscopy were the same for all patient groups, including the year before the nurse-led clinic, and all consecutive patients with urate crystals could potentially be referred to nurse-led care after it was started. The anatomical puncture sites and percentage of patients with tophi or receiving antecedent ULT were comparable across the groups, indicating similar disease stages. We have included factors such as renal insufficiency, gender, older age, tophi and known comorbidities, in the analyses, and this did not alter our overall results.

The overall high 2-year mortality rate of 15% (43/286) posed a challenge regarding how to include or exclude the deaths in the comparison of outcome measures. We made the judgement that the 30 (10%) of patients who died within the first year should be excluded from the analysis of p-urate outcomes for two reasons: first, during the first year, some patients may not have reached the target values for ULT due to potential delays in titration, and second, there might have been a bias towards the most severely ill patients, not being referred to the nurse-led clinic. The exclusion of these patients from the analysis aimed to reduce the impact of these potential biases on the study's findings.

The percentage of patients who did not have their p-urate levels monitored after 2 years was notably higher in the usual care group (30%) compared with the nurse-led group (4%). To account for the potential bias stemming from this situation, we conducted an additional extrapolation of the proportion of patients with p-urate levels below 0.36 mmol/L who were under ULT treatment. The subsequent analysis, following this extrapolation, further underscores the superior effectiveness of nurse-led care in achieving p-urate levels below 0.36 mmol/L.

Results from a randomised clinical trial (RCT) showed that only 8% of patients with gout participated in a trial of nurse-led care after being invited, screened and provided informed consent.[15] However, it is important to note that the study process itself resulted in a significant increase in the usage of ULT in both the nurse-led intervention group and the control group receiving usual care. Therefore, we regard our quality assurance study, conducted without the requirement of informed consent and with complete routine follow-up, as a proper representation of real-life clinical settings. This approach, with the limitations stated above, allowed us to include and evaluate a broader and more representative group of patients, eliminating potential biases associated with strict study limitations that might exclude the most relevant patients from participation in RCT.

We did not exclude any patients from the study, including those with serious diseases. This inclusive approach may have contributed to the overall high mortality rates observed, which were higher than those reported in other studies.[5 10 15 19] Additionally, our patients, on average, were older at the time of diagnosis compared with patients in other studies, suggesting a prolonged period of uncontrolled disease and, consequently, a higher risk of mortality.[5 15 19]

This difference in mortality is likely primarily attributed to patient selection, although the potential role of improved gout control in reducing mortality remains a topic of debate.[15 20–23]

Common misconceptions about gout, such as the belief that it is not a serious condition or that it is self-induced by lifestyle, present significant barriers to effective care.[9 16] As a result, patient education plays a central role in gout management.[7 8 16] Unfortunately, some physicians also hold these misconceptions, and their busy work schedules might hinder their ability to adequately educate patients. To address this, our nurse-led approach prioritised listening to patients' concerns and perspectives rather than delivering authoritative lessons.[15 24] Gradually, we introduced the many advantages of the treat-to-target strategy and emphasised the importance of lifelong ULT with continuous monitoring of p-urate levels.

The study results revealed significant variation in the number of visits and telephone contacts with nurses. The lower-than-planned numbers were attributed to individualised information needs, flares and the impact of the COVID-19 pandemic on hospital visits and transportation, particularly for patients residing at considerable distances from the clinic (up to 150 km in the uptake area). Despite this, we found the nurse-led clinic to be highly cost-effective, with a median of two visits and three telephone contacts within median 336 days. Very few patients required additional visits to a rheumatologist or contact with their GP, as minor issues could typically be efficiently addressed by the rheumatology clinic's staff. In contrast, a British clinical trial of nurse-led gout care reported nine visits and eight telephone contacts within 2 years.[15]

Recent studies have unveiled an alarming increase in hospitalisation rates for patients with gout.[2 25–27] Moreover, healthcare costs for patients with gout might be substantially underestimated, as gout is often unrecognised as the underlying disease and, consequently, not accurately registered.[25] In our study, several patients had prior hospital contacts that retrospectively appeared to be unrecognised gout flares or tophi, erroneously diagnosed, and treated as ulcers, septic arthritis or erysipelas. This emphasises the importance of improved gout recognition and management to avoid unnecessary hospitalisations and optimise healthcare utilisation.

As healthcare costs continue to rise, coupled with an increasing incidence of gout and physician shortages, there is a growing need for more efficient strategies to manage common yet costly diseases. Given the effectiveness and affordability of treatments like allopurinol, nurse-led care initiated in a rheumatology clinic emerges as a promising avenue.[15 28 29]

Our study demonstrates that a low-cost nurse-led gout clinic, primarily based on telephone interventions for 1 year, can be highly successful in achieving a clinically relevant reduction in p-urate levels. This reduction significantly decreases the risk of disease progression, complications and potentially even mortality rates.

Contributors CR conceived and designed the study. JK was study manager. CR and MBL applied for approvement. CR trained the research nurses in gout care. CR and JWL oversaw development of the project database. AMT, HMC, TL, JWL and JK provided the care including patients' gout leaflet. JWL and HMC did the data collection for the nurse-led group and MBL for the period before nurse-led care. CR and MBL advised nurses on clinical issues. CR, MBL and JWL did the clinical data analysis and interpretation. GLN critically reviewed the manuscript and the presentation of data. All authors critically revised the work for intellectual content, approved the final version, and agreed to be accountable for the work. CR is overall guarantor for the study.

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