

ORIGINAL PAPER

Therapy area: Other

Comparing cost of intravenous infusion and subcutaneous biologics in COVID-19 pandemic care pathways for rheumatoid arthritis and inflammatory bowel disease: A brief UK stakeholder survey

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Abstract

Objectives: One important group of people at higher risk from the SARS-CoV-2 (COVID-19) pandemic are those with autoimmune conditions including rheumatoid arthritis/inflammatory bowel disease. To minimise infection risk, many people have been switched from intravenous to subcutaneous biologics including biosimilars.

Design: The survey was designed to understand comparative economic issues related to the intravenous infusion vs subcutaneous biologic administration routes for infliximab. The survey focused on direct cost drivers/indirect cost drivers. Acquisition costs of medicines were not included due to data not being available publicly. Wider policy implications linked to the pandemic were also explored.

Setting/participants: Semistructured single telephone interviews were carried out with twenty key stakeholders across the National Health Service (NHS) from 35 clinical/42 pharmacy/28 commissioning roles. The interviews were undertaken virtually during April 2020. From interview (n = 20) results, a simple cost analysis was developed plus a qualitative analysis of reports on wider policy/patient impacts.

Results: Key findings included evidence of significant variation in local infusion tariffs UK wide, with interviewees reporting that not all actual costs incurred are captured in published tariff costs. A cost analysis showed administration costs 50% lower in the subcutaneous compared to infusion routes, with most patients administering subcutaneous medicines themselves. Other indirect benefits to this route included less pressure on infusion unit waiting times/reduced risk of COVID-19 infection plus reduced patient 'out of pocket' costs. However, this was to some extent offset by increased pressure on home-care and community/primary care services.

Conclusions: Switching from infusion to subcutaneous routes is currently driven by the COVID-19 pandemic in many services. A case for biologics (infusion vs subcutaneous) must be made on accurate real-world economic analysis. In an analysis of direct/indirect costs, excluding medicine acquisition costs, subcutaneous administration appears to be the more cost saving option for many patients even without the benefit of industry funded home-care.

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1 | BACKGROUND

One important group of people at high risk in SARS-CoV-2 (COVID-19) pandemic are those with autoimmune conditions, including those with rheumatoid arthritis and inflammatory bowel disease. This risk is difficult to quantify precisely but is based on the premise that patients with a connective tissue disorder would, by the nature of their condition / treatment and associated immune status, be more at risk of becoming seriously unwell after a Coronavirus infection.

Depending on the complexity of their condition some of the patients in this group may be receiving intravenous biologic infusion therapy which under normal circumstances is usually administered within a hospital or day hospital setting. Prior to the onset of the pandemic, there was a policy of maintaining patients in the community on subcutaneous biologics as part of a "care closer to home" approach.¹ However, a significant number of patients have been managed with intravenous biologics infusion either due to patient clinical status or through patient choice, with some preferring the psychological reassurance of an infusion treatment.

With the ongoing pandemic, infusion units have represented a potential increased risk to patients receiving biologic infusions due to greater (at least theoretical) likelihood of exposure to the COVID-19 virus in a hospital setting. This has led to the need to achieve a careful balance between minimising exposure to infection (which is likely to be higher in a hospital setting) versus ensuring that the disease is kept under control.² Even when the risk of hospital acquired COVID-19 infection diminishes,³ this is still likely to be higher than remaining in the home setting. The National Institute for Health and Care Excellence (NICE) has published guidance to ensure that patients having intravenous treatment are assessed for possible switching to the same treatment in subcutaneous form.⁴ This is consistent with local and regional advice to switch from infusion to subcutaneous, home-based biologics administration.⁵ The approach provides an opportunity in the short to intermediate term to avoid hospital procedures and manage patients only in a community and/or home environment where infection risk is likely to be lower.

For this switching approach to be sustainable over the longer postpandemic period, there needs to be not only further clinical data on switching implications but also economic data to determine the comparative cost and wider resource implications between the two routes of administration. This is particularly important where, for example, the National Health Service (NHS) Trusts and commissioners in England have been asked to move temporarily away from Payment by Results to block contracts in order to concentrate on Covid-19.⁶ The end of these arrangements will offer an opportunity to review contracts and assess the costs and value of switching from infusion to subcutaneous biologics. Also, national tariff rates may not truly represent the administration cost of both intravenous and subcutaneous biologics, with this survey providing an opportunity to clarify the likely actual costs for each of the modes of administration.

A subcutaneous formulation of infliximab received marketing authorisation from the European Medicines Agency (EMA) in 2019 and

What's known

- One important group of people at high risk in COVID-19 pandemic are those with autoimmune conditions, including those with rheumatoid arthritis and inflammatory bowel disease.
- Depending on the complexity of their condition, some of the patients in this group may be receiving intravenous biologic infusion therapy which under normal circumstances is administered within a hospital or day hospital setting.
- The National Institute for Health and Care Excellence has published new guidance to ensure that patients having intravenous treatment are assessed for possible switching to the same treatment in subcutaneous form.

What's new

- A cost analysis showed that administration costs for subcutaneous routes are 50% lower than for infusion routes, with most patients administering subcutaneous medicines themselves.
- Other indirect benefits to this route included less pressure on infusion unit waiting times and reduced risk of COVID-19 infection, along with reduced patient costs.
- Cost savings were partly offset by increased pressure on home-care and community/primary care services.

is currently available in Europe for the treatment of rheumatoid arthritis. Infliximab is used to treat a number of autoimmune diseases including rheumatoid arthritis, Crohn's disease, ulcerative colitis, ankylosing spondylitis, psoriasis, and psoriatic arthritis. The availability of infliximab as both an intravenous and subcutaneous preparation provides a common reference point for this survey against which cost comparisons can be surveyed and evaluated.

The economic costs of medicines can be divided into three categories: *acquisition costs*, *direct costs* and *indirect costs*. Acquisition costs are the cost of acquiring the actual medicine which can vary depending, for example, on tender contract pricing. Direct costs are the service costs incurred in delivering these medicines, including administration costs, healthcare staff, estate, and other resources. Service activity costs therefore explicitly exclude drug acquisition costs, that is, refer to administration costs only. Indirect costs include wider themes such as impact on infusion unit capacity; patient occupational, travel and parking costs; and wider co-morbidity costs such as potential for hospital or transport-acquired COVID-19 infection.

This purpose of this study was to provide a comparative analysis of the cost of biologics infusion and subcutaneous administration, assuming equivalence of efficacy for patients who are clinically appropriate for switching between routes.⁷ A key component of this analysis included the role of national tariff costs as well as direct and indirect costs not included in these tariffs. Additional economic

drivers were also considered including infusion unit capacity costs, individual costs to patients and potential co-morbidity costs from COVID-19 infection. Please note that acquisition costs of medicines were not included as the data for these for this class of medicines are not routinely available publicly and tend to differ from list prices due to local purchasing agreements.

2 | METHODS

2.1 | NHS reference costs of infliximab

For direct administration costs, the NHS regularly produces “reference cost” data which provides a benchmark against which overall service costs can be identified and modelled.⁸ At a local level, the translation of a service activity into a cost statement is undertaken through a coding process. Which code is allocated to a particular activity will therefore determine the formal “tariff” for that medicine or procedure.

Where the parameters for allocating a service activity to a specific code are not clear, cost variation between providers and localities can occur, sometime across a wide range.⁹ The cost of biologic infusion is an example of a service activity that does not have a specific unique tariff as defined by the National Tariff Payment System.¹⁰ Instead, this service activity is normally identified under the class of ‘parenteral chemotherapies’ of which more than one relates to infusional treatments (Table 1).

For other medicines and procedures, such as subcutaneous administration in the community, no clear reference costs exist and there is no formal tariff. The risk of no formal tariff being identified is that the actual costs of an activity can be obscured, meaning services are potentially under costed, and, by implication, underfunded in the longer term. For biologics, many home-administered programmes are funded by medicines manufacturers through home care schemes, which can include medicine delivery as well as clinical teams to train patients to administer their medications and to review them on a regular basis.¹¹ In some areas, these schemes are provided and funded by the NHS rather than industry.

TABLE 1 Summary of HRG codes relevant to biologics infusion (National Tariff Payment System 2019/20)

HRG code	HRG name	Tariff (£)
SB12Z	Deliver Simple Parenteral Chemotherapy at First Attendance	142
SB13Z	Deliver more Complex Parenteral Chemotherapy at First Attendance	284
SB14Z	Deliver Complex Chemotherapy, including Prolonged Infusional Treatment, at First Attendance	426
SB15Z	Deliver Subsequent Elements of a Chemotherapy Cycle	284

In order to establish a baseline of biologics administration costings, semistructured interviews were carried out with 20 key stakeholders across the NHS with clinical, pharmacist and commissioning roles related to biologics administration for rheumatoid arthritis and inflammatory bowel disease. An initial 105 stakeholders across the regions of the UK were invited to express interest by email to take part in the study (35 in clinical/42 in pharmacy/28 in commissioning roles). Stakeholders were selected to be representative of prescribers, pharmacists and commissioners across the United Kingdom. All those who responded with an expression of interest (n = 20) were interviewed.

The survey was undertaken between 5 April and 27 April 2020. The survey was designed to understand the actual estimated costs of each route of biologic administration using infliximab as the reference medicine. Interviewees were recruited from a pool of stakeholders to balance geographical as well as professional role representation. Interviewees responded from England, Wales, Scotland but not Northern Ireland. The breakdown of professional roles interviewed is shown in Figure 1.

The interviews were carried out by telephone using a semistructured interview method focusing on a key question set as shown in Figure 2. Questions between the infusion and subcutaneous groups were equivalent except for items that were unique to one method of administration only. The question set was determined using categories based on standard modelling for medicines economic impact.

From interview (n = 20) results, a simple comparative analysis of costs for each route of administration (infusion and subcutaneous) was conducted, along with a collation and summary of comparative qualitative statements about impact on clinical practise and patient experience.

Respondents were asked to estimate costs across both infusion and subcutaneous administration scenarios. The survey also included identification of the range of current national tariffs for

- Commissioning pharmacists
- Consultants in Rheumatology
- RA service senior managers / directors with budgetary responsibility for RA inpatient services
- Senior CCG pharmacists (e.g. Head of Medicines Optimisation)
- Senior clinical leads (of service or business unit such as Clinical Director)
- Specialist RA pharmacists
- Pharmacists with a specialist knowledge of homecare

FIGURE 1 Breakdown of interviewee by role type

1. Local tariff cost (including cost items contained in the tariff)
2. Non-tariff costs (excluded from tariff)
3. Wastage
4. Infusion capacity & productivity (for example, impact of waiting lists for infusion units)
5. Patient impact / productivity costs (such as fuel and parking costs)
6. Regional variation (for example, based on different coding definitions)
7. Impact of future NHS policies and processes (including that driven by COVID-19)

FIGURE 2 Summary of semistructure interview key question set

biologic infusion and reference costs for subcutaneous administration (where available) to gain insight into the level of alignment between these costs and actual local cost estimates.

2.2 | Patient and public involvement

There was no patient involvement in this study.

3 | RESULTS

3.1 | Reported cost data including tariff and nontariff costs

The average tariff value for infusion reported by interviewees was £414 which is consistent with the published tariff value for "Complex Chemotherapy, including Prolonged Infusional Treatment, at First Attendance" priced at £426.¹² However, other tariff codes are available that are less consistent with the reported averages and which represent lower coding cost points, including those for first attendance and follow up.¹³

In order to compare equivalent costs, a common treatment cycle of 12 months was used as a benchmark. For biologic infusions with infliximab as the reference, this equates to maintenance of every 8 weeks on average, with subcutaneous treatments being given every 2 weeks. The total cycles for infusion were taken as 6.5 per year, with 26 per year for subcutaneous administration. Costs were divided into initial *one-off* costs and *maintenance* costs. One-off cost included, for example, pharmacist medicines management for switch programmes (infusions) and nurse patient training time (subcutaneous). Maintenance costs included ongoing monitoring and administration of medicines where clinically appropriate. From the survey data, comparative costs were then calculated over an annual cycle.

The initial focus on the analysis was to understand the extent to which biologics tariff service activity coding is a reflection of actual direct costs. Table 2 shows reported average and range of infusion tariffs calculated by dose.

3.2 | Relevant costs and reference costs

The next stage of the analysis was to evaluate firstly whether the infusion tariff reflected all relevant costs and secondarily to evaluate

a "reference cost" for community or home-based subcutaneous administration. These individual cost items were reported as summarised in Table 3. Note that hospital and other estate costs were excluded from the analysis as these were reported by all interviewees to be included in the infusion tariff cost. Other "in tariff" infusion costs were included to provide a benchmark against which subcutaneous costs could be estimated.

A number of observations were made. Firstly, there was a wide range of costings used for each of the cost items for the individual identified service activities. All nursing and equipment costs were considered to be in-tariff for infusions, although blood testing (which is often uniquely defined by the disease area and medicine being administered) was excluded from tariff as were uplifts for wastage. The estimated total infusion administration cost of £441 is higher than a previous study of infliximab infusion costs of £382 which included indirect costs such as laboratory tests and GP visits.¹⁴ However, this difference could be accounted for by inflationary and other cost uplift factors in the period since that study was undertaken. The NICE study data indicate costs of £167.68 for infusion and £3.32 for subcutaneous routes of administration.¹⁵ However, in the NICE figures, the cost analysis did not take into account wider direct and indirect costs, whilst the subcutaneous administration cost was based on hospital administration rather than on home delivery and administration.

3.3 | Direct and indirect costs

For subcutaneous administration, where no tariff exists, many of the cost items were reported as equivalent to, or benchmarked by, the infusion cost items. For example, blood tests and pharmacist time were costed similarly across both routes of administration. Where the two routes differed were in the cost parameters, with nurse time in subcutaneous administration being restricted to training the patient to self-administer their medication. Nurse time for infusion is largely driven by time on the ward and is included in the existing tariff. For blood tests, these were usually taken at 12 weeks for subcutaneous routes which is a greater interval than infusion routes which were normally around 8 weeks and coinciding with the hospital infusion appointment. Another important difference to note is that Value Added Tax (VAT) does not apply to community administered medicines whereas this does apply for hospital administered medicines.^{16,17}

When tariff and nontariff costs were calculated together for each route, the total annual costs combining service activities for

Cost item	Infusion service activity
Average number of IV infusions in annual cycle (infliximab)	6.5
Average tariff /reference cost reported per IV infusion	414
Commonest tariff value range reported per IV infusion	400-500
Full range of reported tariffs for IV infusion	100-1000
Annual administration cost (by average tariff)	2691

TABLE 2 Reported average and range of biologics infusion tariff by dose and annual cycle total (cost in £)

TABLE 3 Reported breakdown of biologics infusion and subcutaneous cost drivers including tariff status excluding estate costs (T = In tariff, NT = Not in tariff for infusion activity; NA = Not applicable; Av = Average)

Estimated Item costs	Infusion	Subcutaneous
Average doses in annual cycle (infiximab)	6.5	26
Pharmacist management of medicines process (one off cost (£)) [T]	25	25
Medicine compounding time per dose cost (£) [T]	5	N/A
Nurse time per dose (hours) [T]	2	N/A
Nurse costs reported range [£ per hour] [T]	9-40	9-40
Nurse costs average [per hour] (£) [T] ^a	25	25
Nurse on-costs per hour [20% of salary] (£) [T] ^b	5	5
Patient training by nurse [time] [one off] (mins)[NT]	N/A	30
Patient training by nurse [cost] [one off] (£) [NT]	N/A	15
Nurse cost [per dose] (£) [T]	60	N/A ^c
Nurse cost [per patient annually] (£) [T]	390	15
Giving sets [per dose] (£) [T] ^d	1-5	N/A
Delivery of medicine per dose (£) [NT]	N/A	50
Delivery interval [VAT not applicable] [NT]	N/A	8 weeks (Av)
Delivery of medicine annual cost (£) [NT]	N/A	1300
Wastage IV / SC drug only [per dose] [NT] ^e	1-10% (5% Av)	1-10% (5% Av)
Blood test frequency [NT] ^f	8 weekly	12 weekly
Blood tests cost [per test] (£) [NT]	15-40 (Av 27)	15-40 (Av 27)
Annual blood test cost (£) [NT]	176	117
Total annual reported infusion tariff cost per patient (£) [T only]	2691	N/A
Additional nontariff costs per annum (£) [NT] ^g	176	1457
Total annual cost per patient (£) [T + NT]	2867	1457
Estimated average in-tariff cost per dose (£)	414	N/A
Estimated average in-tariff plus nontariff costs per dose (£)	441	56
Estimated average in-tariff plus nontariff costs per single infusion cycle (one infusion to four subcutaneous doses) (£)	441	224

^aBased on Nurse grade level 5/6.

^bAssuming on-costs (including line management and widerorganisational costs such as HR management) are added 20% of salary.

^cAssuming medicine is self-administered by patient.

^dA sterilised pack for setting up infusions for a patient including swabs, needles and so on.

^eWastage referred to medicines usage only so reported for information only in this table without affecting overall calculation.

^fBlood tests do not include blood therapeutic level testing or antibody testing, which was reported to be rare although estimated to be an average cost of £75 and may be included in the drug cost although limited to one test per patient per annum.

^gCosts that were identified by interviewees as not being included in the official tariff.

each route were £2867 for the infusion route and £1457 for the subcutaneous route per annual cycle, which equates to just over 50% of the infusion route costs. For the infusion route, the additional nontariff direct costs equated to around 7% over and above in-tariff costs, meaning the tariff is an underestimate of the true costs. The overall subcutaneous cost findings are particularly important given the rapid move from infusion to subcutaneous routes during the pandemic. With established biologics delivered subcutaneously in patients' homes or in primary care, the cost is either absorbed by home care (which in turn is usually pharma funded) or by primary care. With rapid switching currently these additional "nonprovider" costs need to be recognised and budgeted for.

3.4 | Regional variations

Across Scotland and Wales, there is no tariff system or purchaser / provider split. The cost of medicines is usually determined by national pricing agreements, so there is little price variation across any of the health boards in Wales and Scotland. This is related to either the HTA approval process through the Scottish Medicines Consortium (SMC) in Scotland or to the national procurement process (tender price) in both Scotland and Wales. The acquisition cost is therefore the key driver for treatment choice rather than the associated service activity costs. Northern Ireland was not included in this analysis as no stakeholders were interviewed from this region.

Another factor here is community location, with reports from interviewees that healthcare providers in more rural areas may be keener to switch to subcutaneous routes than those in urban areas.

Interviewees reported wide regional variations across both application of the national tariff price guidance to coding, along with local cost variations, indicating that there is a need for clearer guidance across both infusion and subcutaneous administration costings and tariff code allocations. The wider range of tariff costs for infusion from £100 to £1000 could have significant implications for resource availability locally for this class of medicines but also implies that the perceived cost effectiveness of subcutaneous administration will depend to some extent on local infusion cost coding.

3.5 | Comparison of cost-effectiveness items for infusion and subcutaneous routes

Subcutaneous administration routes are associated with higher home case treatment costs which could escalate with increased switching away from infusions. Table 4 summarises the cost items for the infusion and subcutaneous routes of administration of biologics using infliximab as the reference.

3.5.1 | Wastage

For infusions wastage of medicines is kept to a minimum based on mg/kg with dose-banding, rounding (up or down) and vial sharing all used to mitigate against drug wastage. The use of set days for each clinic also helps to avoid drug wastage. In one hospital the rheumatoid arthritis and inflammatory bowel disorder patients share the infusion suite so it is possible to coordinate patients on the same drug to avoid wastage through vial sharing. Even so wastage varies a lot with estimates as high as 10% of vials, with an estimated average of 5%.

For subcutaneous administration, treatments in the community are reported at similar levels of 0-10% with 5% being the average. Where wastage does occur, this may be due to patients stopping treatment because of side-effects and lack of response or storage issues (refrigeration), although patients are generally diligent about storage. Adherence to medication is not usually an issue as being symptom free or having reduced symptoms with this class of diseases is a compelling driver for the patient.

3.5.2 | Patient impact

Interviewees all reported likely greater economic cost to patients of the infusion route although did not provide a consistent cost estimate for this. Of the few studies in the literature exploring cost to patients, one identifies significant cost ranges, particularly around hospital parking and lost personal time, with total hospital treatment costs for patients being up to £400.¹⁶ Patient productivity loss is also a factor with up to an estimated three working days a year lost through attendance for biologics infusions, at a patient annual salary loss of over £300 using national salary average hourly payment calculations.¹⁸

3.5.3 | Infusion capacity and productivity

Interviewees reported significant logistical factors such as long waiting lists for infusion units in many regions. This can contribute to worsening of the patient disease status with potential costs linked to relapse. For subcutaneous biologics patients, high demand for homecare nationally due to the pandemic was reported to be an equivalent resource pressure, with many homecare providers struggling to meet demand.

COVID-19 is placing some restrictions on how some homecare services operate. Switching from infusion to subcutaneous biologics may therefore become increasingly challenging although there is a clear and urgent need to achieve this due to policies to reduce exposure of vulnerable patients to COVID-19 infection.

3.5.4 | Impact of future NHS policies and processes (including that driven by COVID-19)

A clear overriding concern of all interviewees was the current and ongoing impact of the COVID-19 pandemic. The changes seen during the pandemic are likely to remain in place in many areas including the shift to community / home-based drug administration. Further key implications of the pandemic reported by interviewees are listed in Figure 3.

4 | DISCUSSION

In an analysis of direct/indirect costs, excluding medicine acquisition costs, subcutaneous administration appears to be the more

Cost item	Infusion	Subcutaneous
Annual direct cost of administration per patient	£2867	£1459
Impact on demand for infusion units	↑	↓
Impact on demand for home care services	↓	↑
Risk of co-morbidities from COVID-19 infection	↑	↓
Patient costs including travel, parking and lost occupational time	↑	↓

TABLE 4 Comparison of cost-effectiveness items for infusion and subcutaneous routes of administration for infliximab

Note: The arrow refers to the direction (higher or lower) vs the scenario in the other column.

FIGURE 3 Summary of key implications for patients receiving biologics administration following pandemic

- Greater emphasis on remote consultations with patients and other health care professionals although certain clinical roles such as physiotherapy are more difficult to deliver virtually
- Continued shift from hospital attendance to increased use of homecare for at least 6-12 months
- Increased use of community-oriented treatments including subcutaneous and oral medicines (such as JAK inhibitors)
- Greater emphasis on the support role of community pharmacies
- Earlier adoption of new therapies to keep patients out of hospitals
- Wholesale review of national, regional and local biologics treatment pathways
- Greater direction about staff redeployment and change of responsibilities
- Potential reconfiguration of Infusion suites resulting in loss of chairs
- Challenges with not enough nurses in training and decreasing numbers of experienced nurses
- Need to provide healthcare for an increasingly ageing population particularly in rural areas who are in the highest risk category for COVID-19
- Focus on more active management of patient expectations, some of whom prefer infusions based on a perception that this route of administration is more efficacious

cost saving option for many patients even without the benefit of industry funded home-care (Table 4). In the direct cost category we found that the infusion route of administration is twice the cost of the subcutaneous route with additional costs such as blood tests routinely not being included in the national tariff (Table 3). Indirect costs of infusion include treatment waiting lists due to the suboptimal capacity of infusion units, along with greater patient costs (travel, occupational time off), as well as increased risk of COVID-19 infection with the associated clinical and personal costs. Drug acquisition costs were not included in the analysis due to lack of publically available data due to local tender contract pricing arrangements. However, overall local comparative route benefits can be calculated using the findings from this paper along with local pricing data.

For subcutaneous administration, where no tariff exists, many of the cost items were reported as equivalent to, or benchmarked by, the infusion cost items (Table 3).¹⁵ For example, blood tests and pharmacist time were costed similarly across both routes of administration. The two routes differed in nurse time required, with nurse time in subcutaneous administration being restricted to training the

patient to self-administer their medication. Nurse time for infusion is largely driven by time on the ward and is included in the existing tariff. For blood tests these were usually taken at 12 weeks for subcutaneous routes which is a greater interval than infusion routes which were normally around 8 weeks and coinciding with the hospital infusion appointment.

Another important difference to note is that VAT does not apply to community administered medicines whereas this does apply for hospital administered medicines (19).

The COVID-19 pandemic has initiated a significant change in clinical practise for most disorders including the autoimmune conditions. Key factors in this practise change include the imperative to keep high risk patients safe whilst maintaining disease control. This paper reports a sample of key stakeholders' views on the nonacquisition costs of infusion and subcutaneous infliximab with the subcutaneous route demonstrating more positive economic impact across direct and indirect cost categories, including the potential cost of COVID-19 infection.

Whilst there is a concern about increasing pressure on home care services,¹² and potentially primary care, subcutaneous routes for the

administration of biologics may be the more economically sustainable option moving forward beyond the pandemic, if key barriers such as home care capacity can be solved. Given high ongoing waiting lists for this group of patients, the implications of this comparative costing are also likely to continue to be relevant in a post-pandemic NHS for the foreseeable future.

The negative impacts of COVID-19 should eventually subside in a postpandemic NHS although long waiting lists for assessment and reviews following pandemic delay are likely to see ongoing higher demand for the foreseeable future with associated implications.

4.1 | Strengths and limitations of the study

Our findings are based on a relatively small sample of stakeholders expert in the field of biologics medicine. Nevertheless, they are relevant to prescribing of biologic agents as we emerge from the COVID-19 pandemic.

However, the information provided was based on their own personal knowledge and opinion which reflects local perceptions of cost and is therefore not a substitute for an indepth health economics study of comparative costs of intravenous and subcutaneous biologics administration.

In addition, wider indirect costs such as impact on infusion units and risk of COVID-19 infection were not quantitatively costed due to lack of information on frequency of occurrence and actual cost impact in the group of patients with autoimmune diseases receiving biologics through these routes.

Nevertheless, the perceptions of the stakeholders interviewed are likely to be a true reflection of how costs are perceived and managed within health economies in England, for intravenous and subcutaneous biologic medicines. These perceptions in turn are likely to have a direct impact on medicines choice from a clinical and medicines funding perspective.

The authors acknowledge that our survey does not take into account longer term real world efficacy comparisons. There is also a recognition that there is a subgroup of patients who, due to disease severity or certain psychological factors, will still be more suitable for infusion. Assuming equivalent clinical efficacy, the comparison in this paper is therefore based on non-clinical factors.

5 | CONCLUSION

A case for biologics (infusion vs subcutaneous) must be made on accurate real-world economic analysis as we have presented here. In an analysis of direct/indirect costs, excluding medicine acquisition costs, subcutaneous administration appears to be the more cost saving option for many patients even without the benefit of industry funded home-care.

DISCLOSURE

No author has any conflict of interest.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the writing and final review of the manuscript. Interviews undertaken by Steven Bramham-Jones.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

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REFERENCES

1. NHS Improvement. (2015). Moving healthcare closer to home. <https://improvement.nhs.uk/resources/moving-healthcare-closer-home/>. Accessed December 31, 2020.
2. Targeted Oncology. (2020). Hospital visits increase risk of infection during COVID-19 pandemic for patients with cancer. <https://www.targetedonc.com/view/hospital-visits-increase-risk-of-infection-during-covid19-pandemic-for-patients-with-cancer>. Accessed December 31, 2020.
3. Treibel TA, Manisty C, Burton M, et al. COVID-19: PCR screening of asymptomatic health-care workers at London hospital. *The Lancet*. 2020;395(10237):1608-1610. [https://doi.org/10.1016/S0140-6736\(20\)31100-4](https://doi.org/10.1016/S0140-6736(20)31100-4)
4. NICE. (2020) Covid-19 rapid guideline: for Rheumatological autoimmune, inflammatory and metabolic bone disorders. <https://www.nice.org.uk/guidance/ng167/resources/covid19-rapid-guideline-rheumatological-autoimmune-inflammatory-and-metabolic-bone-disorders-pdf-66141905788357>. Accessed December 30, 2020.
5. Regional Drug and Therapeutics Centre. (2020) Covid-19 switching from intravenous to subcutaneous infliximab. <https://rdtc.nhs.uk/sites/default/files/publications/c19/9-rdtccovid-19-qaa-switching-from-intravenous-to-subcutaneous-infliximab-version-2.pdf>. Accessed December, 29 2020.
6. Stevens S. Letter to NHS Trusts and Commissioners 17th March 2020.; 2020. <https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/03/urgent-next-steps-on-nhs-response-to-covid-19-letter-simon-stevens.pdf>. Accessed December 27, 2020.
7. Liu J, Sylwestrzak G, Ruggieri AP, et al. (2015) Intravenous versus subcutaneous anti-TNF-alpha agents for Crohn's disease: A comparison of effectiveness and safety. *J Manag Care Spec Pharm*. 2015;21(7):559-566.
8. Improvement NHS. *Approved costing guidance 2020; 2019*. <https://improvement.nhs.uk/resources/approved-costing-guidance-2020/>. Accessed December 31, 2020.
9. NHS Improvement. (2017) *Healthcare costing standards for England* https://improvement.nhs.uk/documents/670/Healthcare_costing_standards_for_England_ACUTE_v2.pdf. Accessed December 31, 2020.
10. NHS Improvement. (2019) *National tariff payment system* <https://improvement.nhs.uk/resources/national-tariff/>. Accessed December 28, 2020.
11. East of England Collaborative Procurement Hub. *What are Homecare Medicines Services?*; 2020. <https://www.Eoecph.Nhs.Uk/What-Are-Homecare-Medicines-Services.Htm>. Accessed December 29, 2020.
12. NICE, HRG Code SB14Z Deliver Complex Chemotherapy, including Prolonged Infusional Treatment, at First Attendance. Accessed March 25, 2021.
13. NHS England—National Cancer Intelligence Network, HRG Code SB15Z Deliver Subsequent Elements of a Chemotherapy Cycle: Accessed March 25, 2021.

14. Tetteh EK, Morris S. Evaluating the administration costs of biologic drugs: development of a cost algorithm. *Health Economics Review*. 2014;4(1):26.
15. National Institute for Health and Care Excellence (2015). Adalimumab, etanercept, infliximab, certolizumab pegol, golimumab, tocilizumab and abatacept for rheumatoid arthritis not previously treated with DMARDs or after conventional DMARDs only have failed. Technology appraisal guidance [TA375], 2015: Accessed December 31, 2020.
16. University of York Centre for Health Economics. (2010) *Hospital car parking: The impact of access costs*. CHE Research Paper 59 https://www.york.ac.uk/media/che/documents/papers/researchpapers/CHERP59_hospital_car_parking.pdf. Accessed January 1, 2021.
17. HMRC internal manual (2016) *VAT Health*. <https://www.gov.uk/hmrc-internal-manuals/vat-health/vathlt6120>. Accessed January 1, 2021.
18. Statista. (2020) National average salary rates. 2020. <https://www.statista.com/statistics/280687/median-hourly-earnings-for-full-time-employees-in-the-uk-since-2006/>. Accessed January 1, 2021.

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