Estimating HCP Labour Time and Cost Saving With the Use of Rapid Rituximab Infusions Versus Standard Rituximab Infusions for the Treatment of Adults With Follicular Lymphoma and Diffuse Large B-Cell Lymphoma in Induction Phase

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Finocchiaro D[1], Goh A[2], Gupta S[3], Bittencourt da Silva L[1], Groves C[4], **Pardeshi R[5]**

[1]Sandoz Biopharmaceuticals, Holzkirchen, Bavaria, Germany; [2]Novartis Corporation, Petaling Jaya, Malaysia; [3]Novartis Healthcare Pvt. Ltd., Hyderabad, Telangana, India; [4]Sandoz UK Limited, Camberley, Surrey Heath, UK; [5]Sandoz Pvt. Ltd., Hyderabad, Telangana, India

Background

- Hodgkin's lymphoma (HL) and non-Hodgkin's lymphoma (NHL) are two distinct types of lymphoma. In NHL, the malignant cells are derived from B or T lymphocytes, and in HL from B cells.[1] The incidence of HL in the European Union (EU) is 2.3 cases per 100,000 with a mortality rate of 0.4 cases/100,000/year.[2]
- NHLs are a heterogenous group of lymphoproliferative cancers. The most common NHL subtypes in developed countries are diffuse large B-cell lymphoma (DLBCL) and follicular lymphoma (FL). In the EU, the NHL mortality rate is 4.4/100,000 for men and 2.8/100,000 for women.[3]
- FL is the second most common subtype of lymphoid malignancies in Western Europe. The annual incidence of this disease has increased to 5/100,000. It accounts for approximately 20% of all types of NHL.[4,5]
- FL is a high burden disease that is associated with hospitalisations and other healthcare resource consumption. In the past, the median overall survival associated with FL was below 10 years. With the availability of new treatments, this period has remarkably increased to up to 20 years.[4,5]
- DLBCL constitutes 30%-58% of NHL cases. The crude incidence in Europe is 3.8/100,000/year.[6]
- The financial burden of DLBCL is high, due to increase in hospitalisations and the cost of therapies.[7]
- About 5,500 and 2,300 people are diagnosed with DLBCL and FL, respectively, every year in the United Kingdom (UK).[8,9] The annual rates of DLBCL and FL are 8.2 and 3.3 cases, respectively, per 100,000 people in the UK. These subtypes are relatively common in adults, with their incidence increasing amongst older ages.[10] The survival rate of patients with DLBCL or FL in England has increased over the past decades.
- Rituximab is a genetically engineered chimeric mouse/human monoclonal antibody and is indicated for patients with FL and DLBCL. It is administered via an intravenous (IV) initiation administration in Cycle 1, followed by either a standard intravenous (S-IV) infusion or a 90-minute rapid intravenous (R-IV) infusion in subsequent cycles, in eligible patients.[11,12]
- Sandoz rituximab biosimilar is the only rituximab that has been approved for R-IV infusion time from Cycle 2 for adult patients with NHL or chronic lymphocytic leukaemia (CLL), if patients did not experience a Grade 3 or 4 infusion-related adverse event during Cycle 1, in its EMA label.[11]
- Intense resource competition for chair time and nursing resources is common in hospitals.[13,14] It also affects patients undergoing treatment with S-IV, which requires ~240 minutes to complete.
- It was recently reported that the National Health Service (NHS) England is already operating with 154,000 fewer full-time staff than it needs. It has been estimated that there will be 44,000 fewer community nurses within 15 years.[14]
- The recent publication of the Netherlands Scientific Council for Government Policy reported that currently about one in seven Dutch workers is employed in healthcare, but in 40 years, one in three people will be required to work in the healthcare sector to meet the projected demand. Solutions that can optimise HCP time and improve internal hospital processes are needed.[14,15]

Objective

- This research aims to quantify the economic and organisational impact of a 90-minute R-IV infusion in comparison with an ~240-minute S-IV infusion on the utilisation of HCPs time for the treatment of adults with FL and DLBCL, in the induction phase, from the perspective of the UK NHS.

Methods

- The target population were patients with FL and DLBCL in induction phase, estimated to be 7,700 newly diagnosed patients with FL and DLBCL requiring treatment in the UK.
- This budget impact model analysed the utilisation of HCPs' time (nurses and pharmacists) and the costs (drugs and human resource time) of treatment with S-IV and R-IV infusions for the treatment of patients with FL and DLBCL during the induction phase, respectively.
- In the current scenario, all patients would receive rituximab by S-IV infusion, whereas in the new scenario, 50% of patients were assumed to receive R-IV infusion.
- For patients receiving R-IV infusion, the first infusion is considered to be S-IV infusion during the induction phase followed by R-IV infusion thereafter.
- The mean number of patients monitored simultaneously in the same treatment room is assumed to be 3.5 patients, as reported in a time and motion study of rituximab infusion in UK hospitals by Rule 2014.[16]
- In the results section, full-time equivalent (FTE) days were considered as the key metric to assess the overall time impact. Savings of HCP time were calculated in minutes then converted to FTE days according to information from the Royal College of Nursing, UK. We assumed that full-time HCPs would work 37.5 hours/week over five days, with an average workday of 7.5 hours. The minimum paid holidays are considered to be 28 days (4 weeks) / annum. FTE hours annually are calculated by multiplying the working hours/week (37.5 hours) by the number of working weeks (52-4=48 weeks), which gives 1,800 FTE hours annually. Further, dividing the FTE hours annually by 7.5 hours gives 240 FTE days annually.[17]

Model inputs

- Data on epidemiology, treatment practices, and drug costs were obtained from published literature. ***(Table 1)***
- Based on the label, the tasks associated with treatments are the same for both S-IV and R-IV infusions; however, the difference is based on the actual reduced infusion time and the 'monitoring during the infusion', which affects the time and cost associated with the respective treatment. This parameter was crucial and considered during the analysis. The base-case model inputs are presented in ***Table 1***.

Table 1. Base-case model inputs

Parameters	Inputs for standard IV infusion	Inputs for rapid IV infusion
Perspective	NHS	
Time horizon	1 year	
Population	Adult DLBCL and FL patients	
Epidemiology inputs		
Patients with DLBCL and FL in the induction phase[8,9]	DLBCL (N=5,500) and FL (N=2,200)	
Mean BSA[18]	1.79 m^2	
Treatment inputs		
DLBCL and FL induction doses[11]	8 cycles of 375 mg/m^2	
Cost		
Rituximab (100 mg, 500 mg strengths)[16,19]	100 mg: £ 157.17 500 mg: £ 785.84	
Treatment room tasks: 100% nurses[16,19]	276.9 mins	126.9 mins
Drug preparation tasks: pharmacist, 74%; pharmacy technician, 3%; registered nurse, 24%[16,19]	315.8 mins	165.8 mins
Treatment monitoring inputs (A)		
Instal peripheral access/line flushing	Time: 10.5 min; Cost: £8.90	
Pre-medication administration	Time: 8.3 min; Cost: £7.03	
Infusion initiation/injection administration and monitoring	Time: 12.8 min; Cost: £10.85	
Monitoring during infusion	Time: 240 min; Cost: £203.36	Time: 90 min; Cost: £76.26
Disconnect infusion line/flush line/ dispose of materials	Time: 5.3 min; Cost: £4.49	
Monitoring post-infusion/post-injection	Time: 0 min; Cost: £0.00	
Drug preparation time and cost (B)		
Drug preparation area tasks (dispensing and preparation)	Time: 38.9 min; Cost: £36.20	
Total process time and cost (A+B)		
Total process	Time: 315.8 min; Cost: £270.83	Time: 165.8 min; Cost: £143.73
Market share*		
Current Scenario*	100%	0%
New Scenario*	50%	50%

*Sandoz assumption; Sources: Lymphoma Action: DLBCL[8]; Lymphoma Action: FL[9]; Rixathon SmPC 2023[11]; Rule 2014[16]; Sacco 2010[18]; Alonso 2023[19]; BSA: Body surface area; DLBCL: Diffuse large B-cell lymphoma; FL: Follicular lymphoma; N: Number of patients; NHS: National Health Service

- All cost inputs were inflation adjusted to the study reference year of 2022 based on the consumer price index.[20]

Results

Base-case results (budget impact on the NHS)

- A considerable difference between the current and future scenarios was observed in terms of provider labour time and cost savings.
- Induction treatment with R-IV infusion compared with S-IV infusion resulted in a saving of 2,567 FTE days (19,250 hours) and 11 freed HCPs during FL and DLBCL treatment over 1 year, equivalent to HCP wage savings of £978,681 due to reduced time spent for R-IV infusion. The summary results from the model are presented in ***Table 2.***

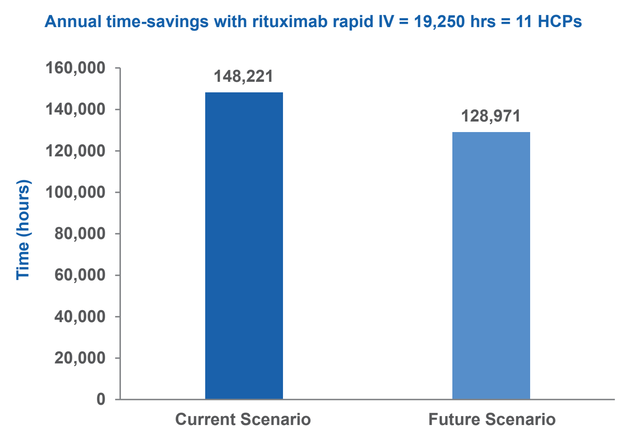
Table 2. Summary of base-case results

Parameters	Current Scenario	Future Scenario
Drug cost	£67,770,472	
HCP time cost		
Administration and monitoring cost	£7,735,373	£6,756,692
Total time (hour)	148,221	128,971
Incremental (hour)	**-19,250**	
FTE days	19,763	17,196
Incremental (FTE days)	**-2,567 (equivalent 11 HCPs)**	
Total cost	£75,505,845	£74,527,164
Budget Impact	**-£978,681.28**	

FTE: Full-time equivalent; HCP: Healthcare professional

- The time-savings with the implementation of rituximab R-IV infusion are presented in ***Figure 1***. This time-saving corresponds to the time of **11 HCPs**. The time saving is equivalent to 1 year of work of **11 HCPs**.

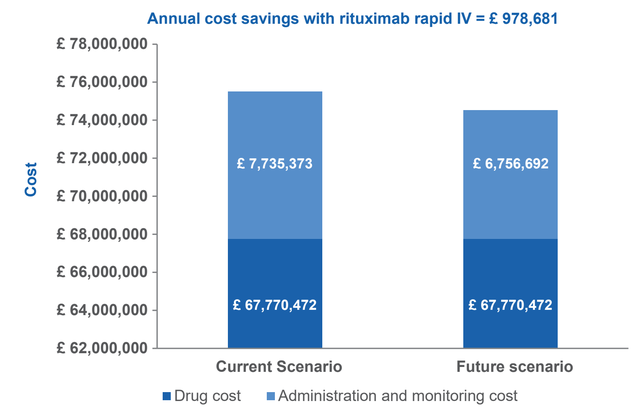
Figure 1. Time-savings with rituximab rapid IV infusion



HCP: Healthcare professional; IV: Intravenous

- The cost savings with the implementation of rituximab R-IV infusion are presented in ***Figure 2.***

Figure 2. Cost savings with rituximab rapid IV infusion



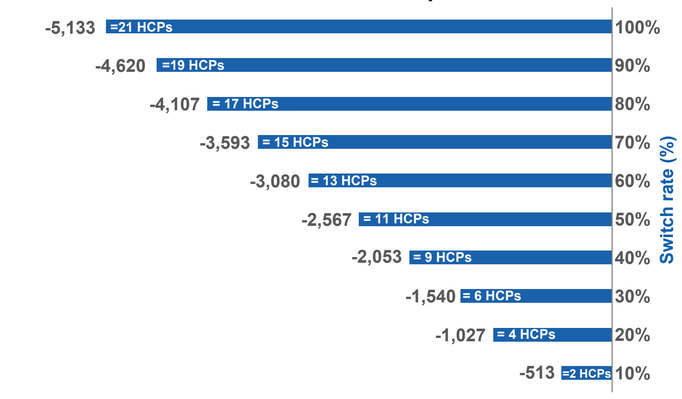
IV: Intravenous

- On a per patient basis, the cost saving in the current scenario with R-IV infusion in the induction phase was £254 (S-IV infusion total cost: £9,805.95 and R-IV infusion total cost: £9,551.75).

Scenario results (annual impact on cost and time with respect to switch rate to R-IV infusion)

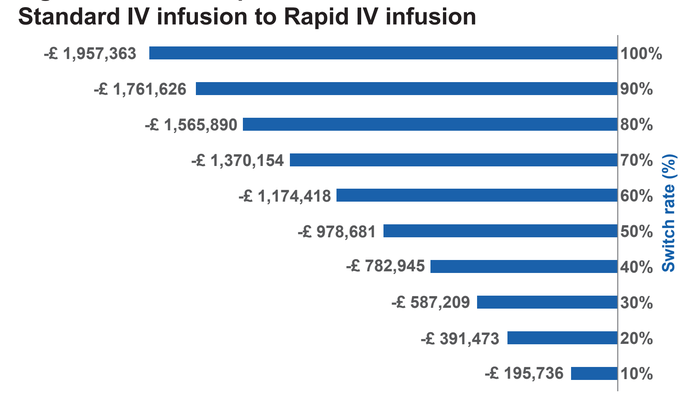
- Assuming all FL and DLBCL patients in induction phase (100%) switched from S-IV infusion to R-IV infusion, it is estimated that as the annual work time of 21 HCPs' time could be saved, equivalent to wage savings of £1,957,363 ***(Figure 3 and Figure 4)***.

Figure 3. Annual impact on FTE days with switch from rituximab Standard IV infusion to Rapid IV infusion



FTE: Full-time equivalent; HCP: Healthcare professional; IV: Intravenous

Figure 4. Annual impact on cost with switch from rituximab Standard IV infusion to Rapid IV infusion



IV: Intravenous

Time-savings for patients

- On a per patient basis, the time-saving over 6 infusions in the induction phase in the current scenario with R-IV infusion in the induction phase was ~5 hours (S-IV infusion time: 19.25 hours and R-IV infusion time: 14.25 hours).

Discussion

- Healthcare systems across Europe are facing growing waiting lists and demands on resources.[14,15] As this demand continues to grow, there may be inadequate numbers of HCPs to meet these needs.[15]
- These challenges can be addressed by implementing processes that can ease the pressure of resourcing and waiting time for patients. One such process could be the implementation of rituximab R-IV infusion to save HCPs' and patients' time, as shown in this model.

Limitations

- The economic modelling involves a variety of assumptions regarding disease condition, treatment, and costs. This model represents a simplification of the complex interplay of these factors and provides an estimate of the costs that may illustrate the budget saving with the adoption of rituximab R-IV infusion.
- The labour costs and FTE time offset from this model are based on the current UK standards. Different impacts could be observed if the model was developed for other countries.

Conclusion

- From the UK provider perspective, there is reduced resource utilisation in terms of HCP time when comparing R-IV infusion with S-IV infusion for the treatment of adult patients with FL and DLBCL in the induction phase.

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