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Letter to the Editor

A 5-year cost analysis of automated red cell exchange transfusion for the management of recurrent painful crises in adult patients with sickle cell disease

ABSTRACT

The painful vaso-occlusive crisis is the most common acute manifestation of sickle cell disease resulting in poor quality of life and high utilisation of hospital facilities. The main disease modifying strategy is treatment with hydroxycarbamide. For patients intolerant or who fail hydroxycarbamide, chronic transfusions are an alternative. Automated red cell exchange transfusion (ARCET) are more effective in lowering rapidly the HbS level while avoiding iron overload. As they require specialised equipment and specially trained staff while utilising higher volumes of blood, there have been concerns regarding the costs involved. We retrospectively analysed data on 23 patients who have been on a regular programme for 1–5 years and found that their utilisation of hospital services reduced by 20%, 48%, 58%, 71%, and 79% after 1, 2, 3, 4 and 5 years respectively. The overall mean annual cost of care per patient was £9702 and £2378 higher than baseline after the 1st and 2nd years of ARCET respectively and then reduced by £5486, £8317, and £14,664 after the 3rd, 4th and 5th year of ARCET respectively indicating that ARCET leads to cost savings to health services in the medium to long term due to reduction in hospital attendance of these patients.

1. Introduction

Sickle cell disease (SCD) is associated with a multitude of acute and chronic complications leading to significant morbidity, poor quality of life, and high utilisation of hospital facilities. The most common clinical manifestation and by far the commonest cause for hospitalisation is the painful vasso-occlusive crisis (VOC) [1]. Treatment options besides supportive care are limited and the main disease-modifying strategies include treatment with hydroxycarbamide [2] while there is growing evidence that chronic transfusion therapy is also beneficial [3,4][3,4]. In the UK, guidance issued recently by the National Institute for Health and Care Excellence (NICE) has recommended automated red cell exchange transfusion (ARCET) using the Optia Apheresis System for all patients with SCD requiring chronic transfusion. According to the same document, adoption of ARCET is expected to lead to estimated National Health Service (NHS) savings in England of £12.9 m annually as a result of limitation of iron overload and need for iron chelation but also reduction in emergency hospital attendance and encourages doubling of the number of patients receiving ARCET in the UK by 2020/21 (https://www.nice.org.uk/guidance/mtg28/chapter/1-Recommendations).

2. Materials/methods

This is a retrospective cost analysis of ARCET for recurrent VOC in our institution. 30 patients have entered at different times a regular programme since June 2011. These procedures were performed in the haematology day unit as day cases (ambulatory ARCET). The target post transfusion haematocrit was set as 0.29 or 0.30 with a target post transfusion HbS <10%. The mean pre-transfusion HbS level was 41% (33–56%). The mean interval between procedures was 7.4 weeks (6–12) with a mean number of red cell units used per procedure of 12.2 (10–14). Data on these patients' emergency/unplanned utilisation of hospital services, referred to as "days in hospital" (DIH), before and after starting ARCET were retrieved from the patients' electronic patient record system. Data on the Trust's income paid by the local care commissioning group (CCG) for these patients' overall care, planned or emergency, before and after starting ARCET were provided from the Commissioning Dataset (CDS) and contract monitoring information. These figures do not include the cost of blood used which is calculated separately as this is paid by the hospital through the pathology budget. Only full years of ARCET were analysed. At the time of collection, 23 of the 30 patients were evaluable for analysis: two patients were excluded as they had been on the programme for less than 12 months and five as they were new patients to our service with no previous data of attendance for comparison. Patient characteristics are summarised in Table 1. Of these 23, 14 patients had completed at least 2 years of ARCET, 12 patients at least 3 years, 10 patients at least 4 years and 4 patients had completed at least 5 years of ARCET. Five patients discontinued after one year and before completion of two years of ARCET: one through his own wish and four due to lack of clinical response. Both DIH and cost of care figures post ARCET were compared to the relevant figures from the year before commencing ARCET.

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Table 1
Patient characteristics.

	Sex	Genotype	Age	Years of ARCET
1	F	SS	33	5
2	F	SS	32	5
3	F	SS	26	5
4	M	SS	40	5
5	M	SS	43	4
6	M	SC	60	4
7	M	$S\beta^0$	43	4
8	F	SS	37	4
9	M	SS	28	4
10	M	SS	58	4
11	F	SS	36	3
12	F	SC	49	3
13	M	SS	33	2
14	F	SS	41	2
15	M	SS	44	1
16	M	SS	30	1
17	M	$S\beta^0$	31	1
18	M	SS	44	1
19	M	SS	29	1
20	M	SS	33	1
21	F	SC	24	1
22	F	SC	26	1
23	M	SS	22	1

3. Results

Compliance with ARCET was overall satisfactory. The mean number of DIH per patient the year before commencing ARCET was 130 days (range 36–284). This reduced by 20%, 48%, 58%, 71%, and 79% 1, 2, 3, 4 and 5 years after starting ARCET respectively (Fig. 1A). The sustained reduction in hospitalisation over time is further highlighted when we analyse separately the emergency hospital attendance for the four patients completing five years of ARCET: this reduced by 39%, 59%, 68%, 69% and 74% after 1, 2, 3, 4 and 5 years of ARCET respectively (Fig. 1B). The mean income per patient the our Trust received from the care commissioning group (CCG) for routine and emergency care each year after commencing ARCET was £188 higher than baseline (mean income/patient generated the year before ARCET) after the 1st year of ARCET and then reduced by £7186, £15,129, £17,060 and £22,147 after the 2nd, 3rd, 4th and 5th years from commencing ARCET respectively. When the cost of blood used for ARCET is also taken into consideration, the overall mean annual cost of care per patient was £9702 and £2378 higher than baseline after the 1st and 2nd years of ARCET respectively and then reduced by £5486, £8317, and £14,664 after the 3rd, 4th and 5th year of ARCET respectively (Fig. 2). As previously reported, the procedures were safe and well-tolerated with a very low allo-immunisation rate while there was no evidence of iron accumulation for any of these patients [4].

4. Discussion

This is single centre retrospective analysis on the reduction in hospital attendance of patients with SCD after the implementation of ARCET. These patients were looked at as a group and the cost of their care per year after ARCET was compared to the cost of their care one year prior to commencing ARCET. Arguably, a weakness of this analysis is that other factors that may have influenced individual patients' pattern of attendance have not been taken under consideration. Such detail could confuse the findings and since these patients have been treated at the same centre in a rather homogenous way we have no reason to believe that would significantly influence the results.

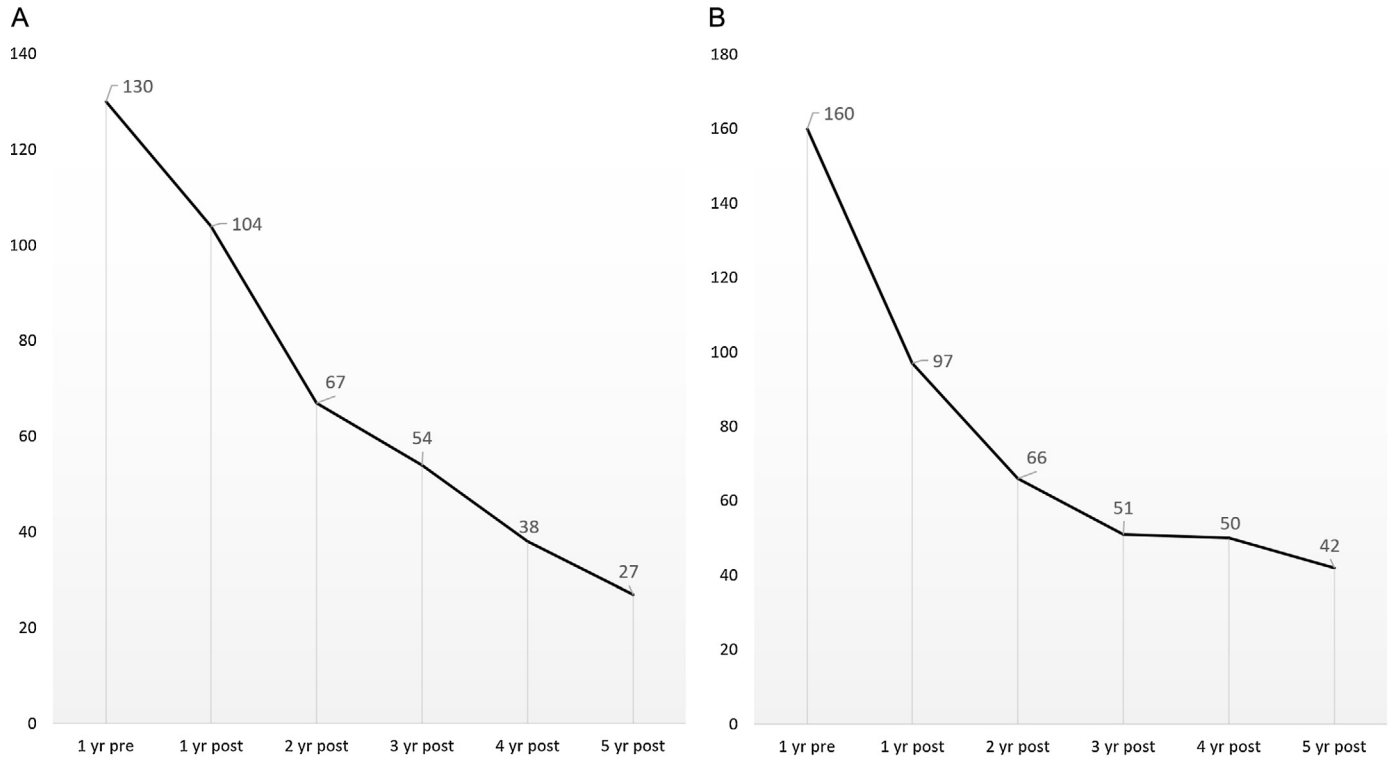

Fig. 1. (A) Mean days in hospital per patient per year for management of painful crises. DIH incorporate in-patient episodes as well as emergency brief visits to the emergency department or the haematology day unit with discharge after analgesia administration in less than 24 h. (B) Mean days in hospital per patient per year for management of painful crises for patients completing at least 5 years of ARCET.