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Treatment for stable HIV patients in England: can we increase efficiency and improve patient care?

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Abstract

Objectives: To estimate the costs and potential efficiency gains of changing the frequency of clinic appointments and drug dispensing arrangements for stable HIV patients compared to the costs of hospital pharmacy dispensing and home delivery.

Methods: We estimated the annual costs per patient (HIV clinic visits and either first-line treatment or a common second-line regimen, with some patients switching to a second-line regimen during the year). The cost of three-, four- and six-monthly clinic appointments and drug supply was estimated assuming hospital dispensing (incurring value-added tax) and home delivery. Three-monthly appointments and hospital drug dispensing (baseline) were compared to other strategies.

Results: The baseline was the most costly option (£10,587 if first-line treatment and no switch to second-line regimen). Moving to six-monthly appointments and home delivery yielded savings of £1883 per patient annually. Assuming patients start on different regimens and may switch to second-line therapies, six-monthly appointments and three-monthly home delivery of drugs is the least expensive option and could result in nearly £2000 savings per patient. This translates to annual cost reduction of about £8 million for the estimated 4000 eligible patients not currently on home delivery in London, England.

Conclusions: Different appointment schedules and drug supply options should be considered for stable HIV patients based on efficiency gains. However, this should be assessed for individual patients to meet their needs, especially around adherence and patient support.

Keywords

HIV, cost, treatment

Introduction

With the success of combination antiretroviral therapy (cART), HIV is a manageable chronic illness for those who adhere and respond well to treatment.[1] It is important for HIV patients to attend routine clinic appointments for monitoring of CD4 count and viral load, to provide on-going counselling to aid adherence and to assess potential drug resistance and adverse effects.[1–3] An adequate supply of cART drugs are prescribed at these appointments to last until their next appointment, plus a one month buffer supply to ensure patients do not run out.[4] It was advised in the past that for stable patients – defined as those with good adherence to a cART regimen, a sustained undetectable viral load, a CD4 count above 200 cells/μL and in sound health for the previous 12 months – these appointments occur every three to four months. However, in light of evidence suggesting that less frequent routine appointments for such patients are safe,[3] UK guidelines now recommend they are scheduled at three to six monthly intervals.[5] Regarding this, common practice is unclear.

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The annual cost to treat HIV patients in the UK is £721 to £758 million in 2013.[6] Financial constraints and the expensive and long-term nature of cART[3,7,8] mean commissioners are seeking greater efficiency.[9–11] One way is to increase the number of stable patients with six-monthly routine appointments[8,12] though consideration must be made for the risk of drug wastage. Patients may stop taking their cART drugs if they develop intolerance or toxicity between their routine appointments and then urgent clinical review would be required. For patients with six-monthly appointments, there is a risk that up to seven months' worth of drugs is wasted, whereas for three-monthly appointments, this is up to four months' worth of drugs.

Efficiencies may also be achieved by changing the way patients receive their drugs.[13] Traditionally, patients have received cART drugs from hospital pharmacies after their appointments. 'Home delivery' involves drugs being sent to a patient's home or specified location, although this is not taken up by all patients/clinics.[13] Home delivery does not incur sales tax (value-added tax (VAT)) as the companies supplying the services are not qualifying institutions[14,15] whereas tax is charged on drugs dispensed at hospital pharmacies.[14] Thus, home delivery could mean financial savings are made because of the VAT savings[13] and the resources of specialist clinics are preserved.[8]

Our aim was to estimate the annual cost of care for stable patients assuming different frequencies of appointments and drug supply methods.

Methods

Model

A model was built in Microsoft Excel to estimate the annual costs of patient appointments and drug dispensing, giving a range of scenarios in which the frequency of both can be varied along with the way drugs are supplied. The direct costs (£UK 2012) were estimated from the NHS perspective and did not include any patient, indirect or wider societal costs. The model is available from the authors. It asks three questions (Figure 1): how often does the patient come for an appointment (3, 4, 6 monthly); how often is the patient supplied their drugs? (3, 4, 6 monthly); and how does the patient get their drugs? (hospital pharmacy dispensing or home delivery).

The model was meant to illustrate the implications of different appointment schedules and frequency/mode of treatment, and we did not aim to estimate the full range of treatment options.

We assumed the frequency of appointments was three, four or six monthly. Drugs would be given with the same frequency, and we also considered six-monthly appointment with drug supply every three months. Drugs could be dispensed at the time of appointment in hospital pharmacies or by home delivery. In the baseline, we assumed appointments were three-monthly and drugs were dispensed in hospital pharmacies every three months.

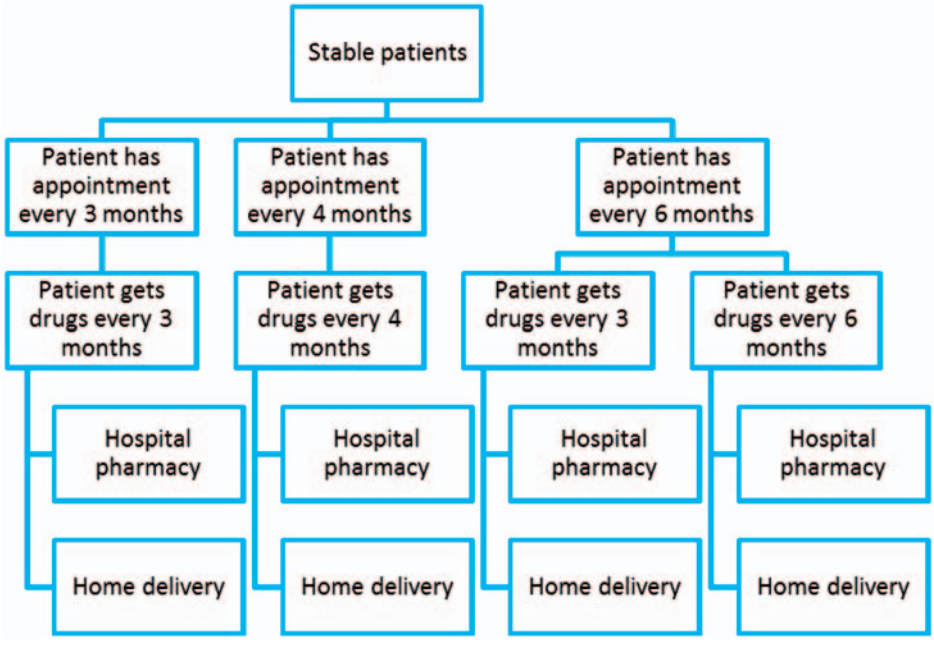

Figure 1. Patient flow through the model, given different frequency of appointments and either hospital pharmacy dispensing or home delivery.

In the model, stable patients may decide to stop taking their drug regimen due to toxicity or intolerance. We assumed they would have an extra clinical visit and would switch to a second-line drug regimen with hospital dispensing for the remainder of the year. This could occur at any point during the year, with a given monthly probability based on audit data. Although no longer considered 'stable' once they switch, these patients were included in the analysis for the full 12 months in order to capture the annual costs of treatment. We assumed that if they switched during a month in which they have a clinic appointment, this appointment would only be counted once. It was also assumed that any drugs already dispensed were added to the total cost and would be considered wastage. This was thought to replicate actual practice, i.e. the costs of any dispensed drugs including buffer drugs are not recoverable.

Audit data

Based on data from an audit of 1400 patients on treatment from a south London hospital, 97 switched to an alternate therapy over nine months due to all causes (0.77% per month, D. Ogden, personal communication). Of those who switched, 37% were on a first-line therapy such as Atripla® and the remainder were on a boosted-protease inhibitor (PI) combination therapy. We used these values to represent the starting point for stable patients in the model, of which all switching would be to a boosted-PI type second-line therapy such as Truvada® + atazanavir + ritonavir with approximately the same costs, based on data from the audit. Patients on both starting regimens and across all those who switched regimens were pooled to estimate the average annual weighted patient costs.

Costs

Costs include the personnel seen during a clinic visit – receptionist, nurse and doctor (including overheads and qualification costs),[16] routine blood tests done at each appointment (urea, electrolytes and creatinine, liver function tests, vitamin D, glucose, full blood count, bone profile, lipid profile, CD4 and viral load) and the first-line or second-line regimen drugs (Table 1 and online Appendix). The blood test costs are the total of all tests and taken from a south London hospital Trust; individual test costs are not shown as this is commercially sensitive Trust information. Although many areas have negotiated lower prices for drugs purchased from pharmaceutical companies, we used the list price from the British National Formulary.[17]

The annual cost of each scenario was estimated, assuming no switch to a second-line therapy; switching at different months through the year; and a weighted average across the year assuming 0.77 patients switch each month. This was done for patients starting on Atripla® and on a boosted-PI combination therapy. A weighted average was estimated across patients starting on both regimens.

We assumed that a small clinic might have 150 stable patients and a large clinic may have 1500 stable patients. We also estimated the potential cost savings in London, assuming there are nearly 30,000 patients receiving ART in 2010 of whom 20,000 have a CD4 count above 200 and are thus assumed to be stable.[18] We assumed that 60% of these already receive drugs via home delivery, and of the remaining patients, 50% would be eligible (varied between 25% and 75%). Therefore, cost savings were estimated for these remaining 4000 patients. In the baseline, we included all patients irrespective of which drug therapy they started on and included all patients who did and did not switch throughout the year.

Results

For stable patients on first-line therapy (Atripla® or similar) who do not switch therapies during the year, home delivery is estimated to be less costly than hospital dispensing at all frequencies of appointment and drug dispensing assuming VAT on drugs is included at 20%[19] (Table 2). With home delivery, the least expensive practice is six-monthly intervals of appointments and drug supply (£8704), six-monthly appointments and three-monthly supply (£8746), four-monthly appointments and drug supply (£8902) and, lastly, three-monthly appointments and drug supply (£9099). For patients who do not switch therapy and who maintain three-monthly appointments and hospital dispensing, a saving of £1488 could result by simply changing from hospital dispensing (baseline) to home delivery. This results in larger savings than changing from baseline to six-monthly clinic appointments and pharmacy dispensing (£380). If you combine both, the biggest cost saving per patient is seen in changing from baseline to six-monthly appointments and six-monthly home deliveries (£1883). This same pattern is seen for patients who stay on second-line therapy without switching, but with higher overall costs, as second-line therapy is more expensive than first-line therapy.

The pattern of costs changes slightly for the annual average weighted costs for patients who switch therapy during the year. Assuming that some patients start on Atripla® and the rest start on a second-line regime, and that 0.77% of patients switch each month, baseline is still the most expensive practice (£11,873). However, the least expensive is six-monthly appointments and

Table 1. Cost inputs used in the model (£2012).

	Item	Unit	Value	Source	Note
	Total routine clinic visit cost (excluding drugs)		£176.38		=A + B + C + F
	Staff cost				
(A)	Receptionist	Per visit	£3.33	Curtis[16]	10 min per visit, Clinical support worker higher level nursing (hospital) (£20 per hour)
(B)	Nurse	Per visit	£48.50	Curtis[16]	30 min per visit, Day ward nurse (£97 per hour of patient contact, including qualification costs)
(C)	Doctor	Per visit	£54.00	Curtis[16]	20 min per visit, Medical Consultant (£162 per patient-related hour, including qualification costs)
(D)	Pharmacist – hospital pharmacy dispensing	Per delivery	£13.65	Curtis[16]	9 min per patient, Hospital Pharmacist band 6, (£91 per hour of patient-related activities, including qualification costs)
(E)	Pharmacist – home delivery	Per delivery	£21.23	Curtis[16]	14 min per patient for a Hospital Pharmacist band 6 (£91 per hour of patient-related activities, including qualification costs)
	Blood tests				
(F)	Bundled costs of routine tests done at all regular appts. and if patient switches to salvage regimen	Per visit	£70.55	St. Georges NHS Hospital Trust	Includes U&E + creatinine, LFT, vitamin D, glucose, FBC, bone profile, lipid profile, CD4 and HIV viral load
(G)	Tests done if patient switches to salvage regimen because drug resistance is suspected	Per visit	£272.40	St. Georges NHS Hospital Trust	Therapeutic drug monitoring, genotype resistance test, additional viral load test at 4 and 8 weeks
	Treatment				
(H)	First line – Atripla®	Monthly cost	£629.90	BNF[17]	One tablet daily
(I)	Second-line regimen	Monthly cost	£741.32	BNF[17]	Truvada® One tablet daily + atazanavir 300 mg daily + ritonavir 100 mg daily
	Drug supply costs				
(J)	VAT	%	20.0%	HMRC[30]	
(K)	First-line treatment –hospital delivery	monthly cost	£125.98	–	Estimated VAT for first-line treatment
(L)	Salvage treatment – hospital delivery	monthly cost	£151.12	–	Estimated VAT for salvage regime A
(M)	Home delivery cost	Per month	£10	–	Assumption

Table 2. Total annual cost per patient (£2012).

		VAT[a]	20% First line to second line		20% Second line to second line		20% Weighted average across all starting regimens		0% Weighted average across all starting regimens	
	Appointment frequency (months)	Drug dispensing frequency (months)	No switch	Weighted across months	No switch	Weighted across months	No switch	Weighted across months	No switch	Weighted across months
Home delivery	6	3	8746	9024	10,195	10,562	9602	9932	9602	9818
	6	6	8704	9153	10,152	10,777	9560	10,113	9560	9978
	4	4	8902	9235	10,350	10,802	9757	10,160	9757	10,040
	3	3	9099	9374	10,548	10,911	9955	10,282	9955	10,168
Hospital dispensing	6	3	10,234	10,461	11,972	12,259	11,261	11,523	9452	9674
	6	6	10,207	10,619	11,945	12,511	11,233	11,736	9424	9847
	4	4	10,397	10,684	12,135	12,513	11,423	11,765	9614	9903
	3[b]	3[b]	10,587	10,812	12,325	12,609	11,613	11,873	9804	10,024

[a]VAT: value-added tax.
[b]Baseline.
Given no therapy switch, switching at each month during the year and the annual weighted average, assuming 0.77% monthly switching, from a first-line therapy switching to second-line regimen, a second-line regimen switching to another second-line regimen, and the weighted averages across all starting regimens. VAT was assumed to be 20% in the baseline and assumed to be 0% in the sensitivity analysis.

three-monthly home delivery (£9932), changing from baseline to this practice would save £1941.

Patients on home delivery who change to second-line therapy early in the year incur the highest annual costs. This is due to only the first instalment of drugs being exempt from VAT; the rest incur VAT because of pharmacy dispensing (as they would not be considered stable patients and not eligible for home delivery), and several months of wasted drugs.

Further details appear in Figure A in the Supplementary material online.

There is a different pattern if VAT is charged at 0%. Again, the least expensive scenario is six-monthly appointments and three-monthly drug dispensing (£9674) but with drugs dispensed via hospital pharmacy. The most expensive practice is three-monthly appointments and home delivery (£10,168). Therefore, most of the cost savings in the main results are driven by the savings in VAT when it is charged at 20% (see Figure B in the Supplementary material online.).

If results are scaled up to the size of a small clinic (150 patients), then there could be savings of £291,146 annually if all patients change to six-monthly appointments and three-monthly home drug delivery from baseline. For a large clinic with 1500 patients, this could mean efficiency gains of just under £3 million annually. If we scale up to half of eligible patients in London (4000 patients), this would be £7.8 million annually (a range of £3.9–£11.6 million assuming 25%–75% of those eligible patients switch).

Discussion

Changes to the way stable HIV patients are managed may achieve considerable cost efficiencies. Given that some patients switch treatments, the least costly frequencies of appointments and drug dispensing are always six-monthly and three-monthly, respectively. If drugs are provided via home delivery, additional efficiencies could be achieved. However, if VAT were charged at 0% for drugs dispensed in hospital pharmacies, this would then become less costly than home delivery although there would be a net loss of value from a societal perspective. Overall, the biggest cost efficiencies can be made by scheduling routine appointments at six-month intervals and supplying drugs by home delivery every three months.

Previous modelling work from the United States estimated that ART can form 77% of the total cost of health care for patients with a CD4 count >300 cells/μL.[7] Outpatient visits are a further 9%. Therefore, if it is possible to reduce these costs by up to 16%, as our model suggests, then this would have a large impact on the total annual costs of HIV care.

Home delivery of medicines has been used by the NHS for a variety of diseases and conditions, for example, in vitro fertilisation, oncology and multiple sclerosis.[20] It was first adopted in the treatment of HIV patients in 2004 and shown to be safe compared to medicines supplied through clinic pharmacy.[21] More recently, there has been interest in outsourcing

outpatient dispensing services that could produce additional savings over hospital dispensing.[15] However, there are many different models, and we have focussed on home delivery as costs were easier to estimate.

There is increasing evidence that routine clinic appointments at six-month intervals for stable patients on cART is safe, does not increase the risk of treatment failure and is more flexible and convenient for patients.[3,5] The British HIV Association, European AIDS Clinical Society and US Department of Health and Human Services now recommend that clinic visits can be extended to this frequency.[5,22,23] We have shown that the benefits of a lower frequency of routine appointments may outweigh the costs associated with drug wastage as a result of switching therapy. However, the level of adherence is influenced by a complex interaction of factors,[1,2] and the degree to which contact time during routine appointments affects adherence is largely unexplored. It is possible that reducing appointment frequency leads to less opportunity for adherence support, meaning non-adherence and treatment failure are more likely.[3] Similarly, pharmacy dispensing allows medication advice, avoidance of drug interactions may enhance adherence and reduce drug wastage, with implications on the costs we describe here. Additionally, patients are often informed of the importance of clinic engagement during their treatment, therefore reducing contact time with clinicians may lead to added confusion and anxiety.

Recommendations about reducing clinic visits would be unlikely to apply to patients with special clinical needs, regardless of being stable,[4,5] The frequency of clinic visits will also depend on the stage of the disease and the patient's need for ancillary services such as mental health services and HIV education,[24] and other factors including age, sex,[25] pregnancy[5] and intravenous drug use.[26] For example, many older people are living with HIV infection, due to the success of ART[2,27] with considerable HIV transmission rates among those over 50 years old.[28] Ageing may bring new, unexpected health challenges to people living with HIV and their health care providers.[2,27] Physiological changes associated with ageing affects pharmacokinetics, which in turn can affect the toxicity of drugs. While many of these patients may have been receiving treatment for many years and are at a low risk of non-adherence, it is important for older people living with HIV to be carefully and regularly monitored.[5]

This is the first published empirical evidence of its kind, and we hope it will be used to inform commissioners and clinicians and shape the delivery of HIV healthcare in London and the rest of the UK. The model allows local costs to be used to generate results for a particular clinic or Trust. The framework and ideas are in line with the English Department of Health's Quality, Innovation, Productivity and Prevention Programme.[9] We did not attempt to provide new cost estimates for HIV care and treatment as this is the focus of the HIV Outpatient Tariff under development,[29] and as such, not all costs were included in our model. Instead, we suggest that there are more cost-effective modes of treatment delivery. If costs can be saved by changing the way drugs are delivered, an HIV clinic may be able to use these additional funds within their current budget to increase patient numbers or services thereby improving their overall care for people with HIV without needing additional funds. However, decisions should be made on a case-by-case basis, according to patient preference, response to cART, and a range of other demographic, clinical and psychosocial factors.

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Supplementary Material

The online figures are available at http://hsr.sagepub.com/supplemental-data.

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