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Sir,

**Why outpatient initiative clinics fail to deliver: an analysis by mathematical model**

Extra or 'initiative clinics' are often held to reduce waiting times for outpatient appointments. Their beneficial effect however appears to be short lived. M$^3$P—Medical Mathematical Model Programme—a versatile and customisable software to analyse outpatient data was devised by us to analyse the throughput of patients in outpatient clinics. Parameters can be varied to take account of the different work patterns of any specialty. The number of doctors, time spent per patient by each doctor, different case-mix, duration of clinic, nonattendance rate, and different discharge rate by less experienced doctors can be altered to reflect clinic activity. Very few mathematical models exist which analyse patient throughput in the NHS.[1–3] We used M$^3$P to analyse the effect on throughput of two different types of initiative clinics.

## Materials and methods

The programme was set up to simulate a weekly clinic with four doctors, each working for 200 min. New patients were allocated 15 min, and follow-ups 10 min.

Analysis of referrals to our ophthalmic outpatients showed that there were broadly four main types of patients.

- Type A. Seen once and discharged, for example, blepharitis.
- Type B. Seen then reviewed at 12 weeks and discharged, for example, cataract, operated and discharged 3 months later.
- Type C. Seen and reviewed at 2 months and then seen at 6 monthly interval until an average 4 years when the patient leaves the district or is lost to follow-up, for example, continuous follow-up for glaucoma or diabetic retinopathy.
- Type D. Seen and reviewed at 4, 12, and 26 week and discharged. This includes a variety of patients (eg vein occlusions) reviewed 3 times then discharged, or lost to follow-up. These are average time intervals.

A random mix of these four types, equally weighted, was placed on the waiting list. M$^3$P was set up so that the doctors would see all the booked follow-ups and use the remaining time to see new patients from the top of the waiting list. The programme was run for 400 weeks to reach a steady state, mirroring a well-established standard clinic.

M$^3$P was then run for a further 156 weeks with the programme calculating the total number of new patients seen since the 400th week, on a week on week basis.

The first simulation consisted of 8 weekly nonselective initiative clinics (NSC), starting in the 400th week, in which 10 new patients were seen per clinic. The followups that resulted were booked in the normal weekly clinic. Again, the total number of new patients seen from the 400th week was calculated, on a week on week basis. The results from the standard clinic were subtracted from these data to calculate the gain in the total number of new patients seen since the 400th week.

The second scenario is similar to the first, but with Selective initiative clinics (SC). Instead of taking the patient from the top of the waiting list, the SC only takes Type A patients out of the waiting list. These generate no follow-ups, but the ratio of the different types of patients on the waiting list change. Less Type A are seen in the subsequent weeks in the noninitiative clinics and consequently more follow-ups are generated.

Each simulation was repeated 100 times, and an average taken.

## Comment

The gain in extra patients seen for the two different simulations is plotted *vs* time in Figure 1.

There is an early dramatic drop in gain so that by 25 weeks, the gain is halved. By 52 weeks, the gain stabilises at about 30 (37.5%). The follow-ups generated by the initiative clinics take up the time in the standard clinic, which would normally have been available to see new patients. This occurs even in the selective clinics as there are now less Type A patients to be seen in the normal clinics and less patients are discharged on their first visit to the clinic.

The graph oscillates with time because of the cohort effect of follow-up visits generated.

Papadopoulos *et al*[4] have argued that the NHS waiting lists exhibits edge of chaos behaviour and as such are resistant to change. With M$^3$P, we have a simpler explanation. However, what was surprising is the magnitude of this effect. We have shown that the overall

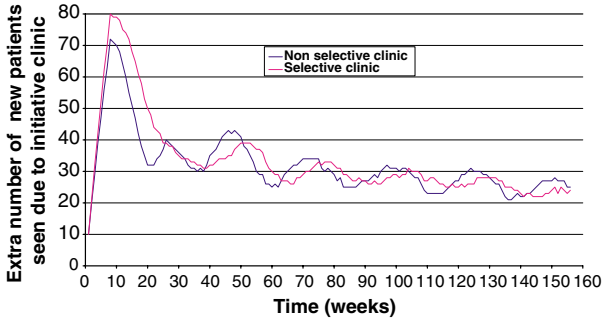


**Figure 1** Extra number of new patients seen as a result of initiative clinics *vs* time in weeks. NSL, nonselective initiative clinic; SL, selective initiative clinic.

gain in extra new patients seen is short lived and that within 25 weeks the actual gain is halved. The exact figures will depend on the parameters used. However, the conclusions are generally applicable to all initiative clinics.

As a rule at least twice as many patients need to be seen in an initiative clinic than one might think. Clinical directors should keep this in mind when planning initiative clinics if they are to achieve targets.

### Conflict of interest

MJS wrote the software M3P.

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## Retinal haemorrhages in an infant following RetCam screening for retinopathy of prematurity

### Introduction

The RetCam 120 (Massie Research Laboratories, Inc., Dublin, California) is a digital retinal camera for use in pediatric ophthalmology, mainly for screening babies for retinopathy of prematurity (ROP) or diagnosing and photo-documenting retinal haemorrhages in children with suspected 'shaken baby syndrome'. The hand held camera is placed on the cornea interfaced with ophthalmic lubricant. Its advantage over conventional indirect ophthalmoscopy is that of data recording and because the RetCam is easy to use, it has been promoted for use by emergency room medical staff, photographers and nurses.
We report a case in which retinal haemorrhages developed shortly after a baby had been ROP screened using the RetCam.

### *Case report*

Our practice follows the UK national guidelines for ROP detection by screening babies $\leqslant$31 weeks gestation, or under 1501 g-birth weight starting at 6–7 weeks postdelivery with subsequent examinations at least every 2 weeks until vascularisation has progressed into zone 3 of the peripheral retina.[1] Screening is undertaken conventionally by a consultant ophthalmologist using indirect ophthalmoscopy and also by a trained neonatal nurse using RetCam photo documentation. The RetCam had been in use on the unit for 18 months at the time and its efficacy in identifying ROP was being assessed, with the nurse RetCam screening the babies prior to re-examination, usually within 30 min, by the consultant using indirect ophthalmoscopy.

A 25-week gestation baby (birth weight 920 g) underwent initial examination on postnatal day 44. On re-examination on day 50, the RetCam picture showed no retinal haemorrhages (Figure 1). However, examination by the ophthalmologist, around 30 min after RetCam

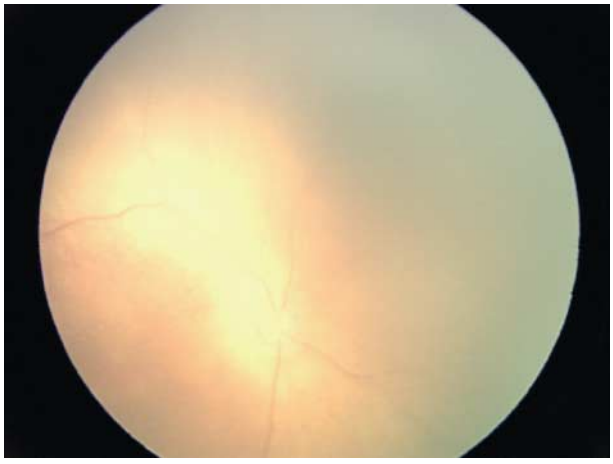

**Figure 1** Initial RetCam fundus photograph showing no retinal haemorrhages.