How many surgery appointments should be offered to avoid undesirable numbers of 'extras'?

TONY KENDRICK

SALLY KERRY

SUMMARY
Background. Patients seen as 'extras' (or 'fit-ins') are usually given less time for their problems than those in pre-booked appointments. Consequently, long queues of 'extras' should be avoided.
Aim. To determine whether a predictable relationship exists between the number of available appointments at the start of the day and the number of extra patients who must be fitted in. This might be used to help plan a practice appointment system.
Method. Numbers of available appointments at the start of the day and numbers of 'extras' seen were recorded prospectively in 1995 and 1997 in one group general practice. Minimum numbers of available appointments at the start of the day, below which undesirably large numbers of extra patients could be predicted, were determined using logistic regression applied to the 1995 data. Predictive values of the minimum numbers calculated for 1995, in terms of predicting undesirable numbers of 'extras', were then determined when applied to the 1997 data.
Results. Numbers of extra patients seen correlated negatively with available appointments at the start of the day for all days of the week, with coefficients ranging from -0.66 to -0.80. Minimum numbers of available appointments below which undesirably large numbers of extras could be predicted were 26 for Mondays and four for the other weekdays. When applied to 1997 data, these minimum numbers gave positive and negative predictive values of 76% and 82% respectively, similar to their values for 1995, despite increases in patient attendance and changes in the day-to-day pattern of surgery provision between the two years.
Conclusion. A predictable relationship exists between the number of available appointments at the start of the day and the number of extras who must be fitted in, which may be used to help plan the appointment system for some years ahead, at least in this relatively stable suburban practice.

Keywords: practice management; appointments.

Introduction

DURING the 1960s and 1970s, general practices in the United Kingdom (UK) moved away from offering 'open' surgeries — accepting all patients prepared to come and wait to be seen — and instead introduced appointment systems, particularly in group practices.[1-3] Such systems mean patients spend less time in

T Kendrick, FRCGP, professor of primary medical care, University of Southampton. S Kerry, MSc, honorary lecturer in medical statistics, St George's Hospital Medical School, London.

the waiting room, and allow more efficient scheduling of doctors' time.[2,4] However, once the appointments are all filled, patients may not be able to book to see their doctor for some days and may be put off consulting altogether.[2,4,5]

To avoid turning people away with problems that need to be dealt with the same day when all appointments are filled, many UK practices offer patients the choice of coming and joining a queue to be seen in an 'extra' or 'fit-in' consultation.[4] However, large numbers of 'extras' mean frustration for the patients who have to wait; stress for the receptionists who have to deal with unhappy patients and manage lists of extras in addition to the booked list; and stress for the doctors who must consult more quickly, spend longer in surgery than planned, or both.[6] Patients seen as 'extras' are likely to be given less time to discuss their problems, and this issue is therefore highly relevant to the quality of care in general practice.[7]

Ideally, at the start of each day, there should be enough empty appointments available to cope with the expected demand and to avoid too many 'extras', while avoiding wasting doctors' time by leaving many appointments unused at the end of the day. If the minimum desirable number of available appointments at the start of the day is identifiable, then the need to provide more appointments, by laying on more surgeries or employing locum doctors or both, can be predicted in advance as soon as the availability drops to the crucial level. However, it is not known whether there is a sufficiently predictable relationship between the number of appointments available at the start of the day and the number of 'extras' that subsequently have to be fitted in that day.

The aim of this study was to determine whether such a relationship exists and, if so, to develop a method for calculating minimum numbers of available appointments at the start of the day below which an undesirably large number of 'extras' could be predicted. To take into account the effects of changes in the patterns of patient demand and a practice's provision of surgery sessions over time, a further aim was to examine the utility of the minimum numbers of available appointments calculated in this way. This was achieved by testing how well these minimum numbers predicted undesirable numbers of 'extras' for a subsequent period, in this case two years later.

Method

Setting

The study was carried out in a health centre group practice in Chertsey, Surrey; a suburban area with levels of social deprivation close to the national average.[8] The list of 9700 patients (to the nearest 100) was shared between five half-time, one three-quarters-time, and two full-time principals. The existing practice policy, based on trial and error, was to offer at least three morning surgeries and two evening surgeries routinely each day, employing locums when necessary. The usual number of appointments offered was 19 in morning surgeries and 15 in evening surgeries, with bookings at 10-minute intervals using a manual system. Once all appointments were filled, patients requesting to see the doctor would be offered the next available slot, usually for the next day, or offered the choice of joining a list of 'extras' to be

fitted in at the end of surgery. To discourage patients from routinely relying on being seen as an 'extra', they were advised that these slots were for urgent problems only and that they could not be sure they would see the doctor of their choice.

Determining the relationship between available appointments and numbers of 'extras' seen

During 1995 and 1997, the receptionists recorded each morning, before the surgery opened, the number of available appointments that day. At the end of the day they also recorded the number of patients seen as 'extras' and the number of any appointments unused that day.

Using the statistical software package *Stata*,[9] the relationship between available appointments and 'extras' seen was examined for 1995. Weeks containing bank holidays were excluded as they were expected to be atypical of the usual Monday to Friday pattern of consulting. For all remaining weeks, the number seen as 'extras' was plotted against the number of appointments available at the start of the day, separately for each day of the week. Rank correlation coefficients were calculated to determine the strength of association.

Calculation of minimum numbers of appointments required using logistic regression analysis

The aim was to determine the minimum numbers of available appointments at the start of the day below which an 'undesirably large' number of 'extras' was more likely than not to result. An undesirably large number was defined in this practice as 15 or more. Any definition of undesirable is arbitrary, but this number was chosen because it would give an average of three or more 'extras' per doctor per surgery; a significant increase that might justify arranging a whole additional surgery session.

Logistic regression was used with the log of the odds of getting an undesirably large number of 'extras' as the outcome variable; that is log $(p/(1-p))$, where p is the probability of 15 or more 'extras' for a particular number of available appointments. The number of available appointments at the start of the day was the independent or predictor variable. From the resulting equation the number of available appointments that gave a particular probability of getting 15 or more 'extras' could be determined. A probability of 0.5 was chosen as there was no indication of whether to minimize either false positives or false negatives (unlike, for example, when this method is used to determine normal ranges for the results of diagnostic or screening tests). The aim was to strike a balance between avoiding too many 'extras' on the one hand and wasting the doctor's time on the other by offering so many appointments that increasing numbers would be left unfilled.

The positive and negative predictive values of the calculated minimum numbers of available appointments, in terms of predicting undesirably large numbers of 'extras', were then determined for the 1995 data. To determine the utility of the minimum numbers over time, their positive and negative predictive values were again determined when applied to data for 1997.

Changes in appointments offered and patient attendance between 1995 and 1997

Data were also collected on the numbers of surgeries offered each day, the total appointments offered per week, and the total 'extras' seen per week, to identify changes in the pattern of appointments offered and patient attendance between 1995 and 1997. This was to provide the context against which to view the utility of the 1995-derived minimum numbers when applied to the 1997 data.

Results

Relationship between available appointments and numbers of 'extras' seen

Data for eight weeks during 1995 were excluded as they contained bank holidays. Data were available for 211 weekdays from the remaining 44 weeks, the receptionists having omitted to record the available number of same-day appointments on nine days.

Figure 1 shows the number of 'extras' seen against the number of same-day appointments available at the start of the day. On all days, there is a significant negative relationship between the two variables, with rank correlation coefficients ranging from −0.66 to −0.84. It is apparent that the pattern is different for Mondays compared with the other four weekdays. On the other weekdays, there were many more occasions where there were few available appointments at the start of the day, and yet the number of 'extras' remained within desirable limits.

The number of 'extras' seen per day ranged from zero (on nine days) to 38. Undesirably large numbers (15 or more) were seen on 57 days (27% of days for which data were available), including 17 Mondays (43%), 10 Tuesdays (23%), 12 Wednesdays (29%), nine Thursdays (21%), and nine Fridays (21%). Undesirable numbers of 'extras' were significantly more likely on Mondays compared with the other four weekdays ($\chi^2 = 6$, degrees of freedom (df) = 1, $P = 0.014$).

### Calculation of minimum numbers of available appointments needed

Minimum numbers of available appointments at the start of the day, chosen such that the logistic regression analysis predicted a probability of 0.5 or greater of having 15 or more 'extras', were 26 on Mondays and four for each of the other four weekdays. These are shown graphically in Figure 1.

Table 1 shows the numbers and percentages of low-availability and high-availability days (on which the number of same-day appointments was below or above the calculated minimum number required respectively) on which 15 or more 'extras' were seen. In 1995, an undesirably large number of 'extras' resulted in 73% of low availability days (positive predictive value of 73%) and 12% of high availability days (negative predictive value of 88%).

Changes in appointments offered and patient attendance between 1995 and 1997

The patient list size, to the nearest 100, did not change between 1995 and 1997. The number of full-time equivalent doctors in the practice did not change either, but the number of sessions worked by individual doctors did vary over time and more appointments were offered in some of the surgeries. The mean number of surgeries offered on Tuesday afternoons and Wednesday afternoons fell between 1995 and 1997 (from 3.8 to 2.9 and from 3.4 to 3.0 respectively), and more surgeries were offered on Thursday mornings and Thursday afternoons (increasing from 3.8 to 4.4 and from 3.6 to 4.1 respectively). The number of surgeries offered on the other weekdays remained the same. However, the total mean number of appointments offered per week increased from 703.5 in 1995 to 718.5 in 1997.

The mean number of 'extras' seen per week increased from 48 in 1995 to 57 in 1997. In 1997, undesirably large numbers of 'extras' were seen on 55 days (27% of the 200 days for which data were available); a similar proportion to 1995. However, there were more Mondays with 15 or more 'extras' in 1997 (30 [68%] of the 44 Mondays included).
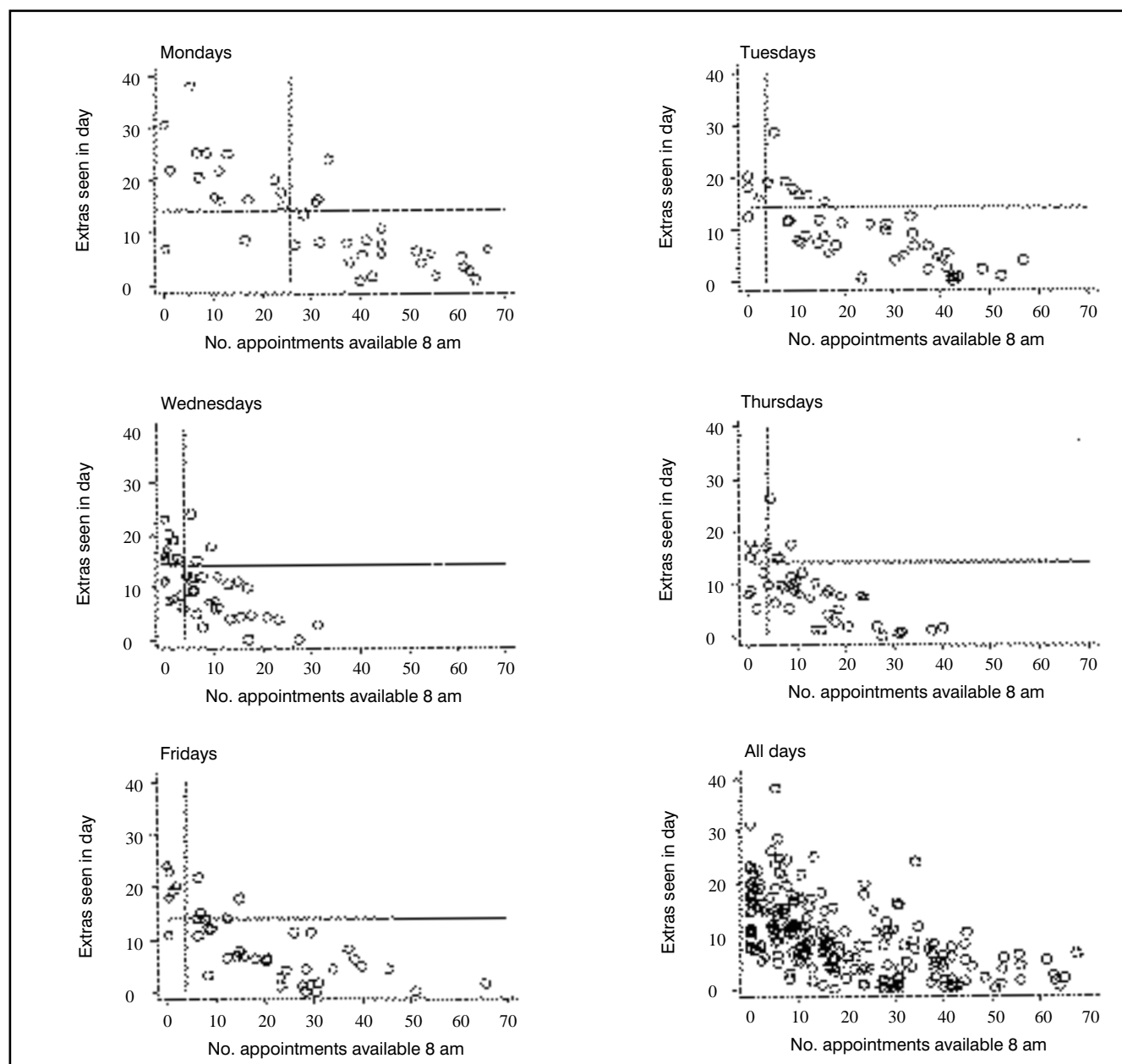
Figure 1. Extra patients seen in a day plotted against the number of appointments available at the start of the day (8.00 am) for each day of the week and all days combined (1995 data). Rank correlation coefficients: Mondays r = -0.80, Tuesdays r = -0.84, Wednesdays r = -0.66, Thursdays r = -0.72, Fridays r = -0.78, and for all days combined r = -0.65 (all correlations statistically significant, $P < 0.05$).

Table 1. Predictive values of the calculated minimum numbers of available appointments in determining 'undesirable' numbers of 'extras'.

	1995				1997			
	Days of low availability		Days of high availability		Days of low availability		Days of high availability	
	n	Number (%) with undesirable number of 'extras'	n	Number (%) with undesirable number of 'extras'	n	Number (%) with undesirable number of 'extras'	n	Number (%) with undesirable number of 'extras'
Mondays	16	14 (87)	24	3 (13)	28	23 (82)	16	7 (44)
Tuesdays	4	3 (75)	40	7 (18)	2	1 (50)	38	10 (26)
Wednesdays	15	9 (60)	27	3 (11)	3	1 (33)	32	6 (18)
Thursdays	10	6 (60)	33	3 (9)	0	0	39	3 (8)
Fridays	7	6 (86)	35	3 (9)	0	0	42	4 (10)
Total	52	38 (73)	159	19 (12)	33	25 (76)	169	30 (18)

Application of 1995-derived minimum numbers to 1997 data

Table 1 also shows, for 1997, the numbers and percentages of low- and high-availability days (according to 1995-derived definitions) on which undesirably large numbers of 'extras' were seen. Overall, the positive and negative predictive values of the 1995-derived minimum numbers were 76% and 82% respectively when applied to the 1997 data.

Discussion

This study suggests that, given the number of available appointments at the start of the day, the number of 'extras' is predictable to an extent. The calculated minimum numbers of appointments required give predictive values of around 75% to 80%, leaving a sizeable element of uncertainty. This is not surprising given that demands for medical attention will vary from season to season and week to week, which has not been brought out in this analysis of the year as a whole.

However, the demand does not expand inexorably to fill the number of available appointments. In this practice, there were a few days throughout the year when appointments were left unused at the end of the day, although not many. The number of appointments offered was such that 'extras' nearly always had to be seen, which meant that doctors were rarely left waiting around unoccupied during surgery hours. However, on most days the receptionists were dealing with extra patients, who were often more ill than patients with pre-booked appointments, yet had to wait in line to be seen.

It would prove very costly to employ locums to provide extra surgeries on more than one in four days. However, providing more appointments would be preferable to simply building up 'extras' lists, and these results can help to plan the appointment system more rationally by giving an indication of the number of surgery sessions needed throughout the five days of the week. Action can also be taken to provide more surgery sessions a few days in advance if it becomes apparent that available appointments have dropped below the minimum number required, hopefully in time to employ a locum if necessary. Another option would be to identify a separate 'duty doctor' who would offer an extra surgery session on those days when the available appointments fell below the minimum number required.

The minimum numbers of available appointments required that were calculated for 1995 performed well when applied to 1997 data, with positive and negative predictive values remaining relatively high at 76% and 82% respectively. This method is therefore useful over at least two years, despite increases in patient attendance and shifts in surgery provision between the days of the week during that time. Although the list size remained similar, the numbers of patients attending booked appointments increased by three patients per working day, and the number of 'extras' by two patients per working day. The proportion of Mondays on which 15 or more 'extras' were seen increased from 43% in 1995 to 68% in 1997, perhaps because fewer surgeries were being offered on Tuesdays, making it more difficult for reception staff to offer patients appointments for the following day.

Clearly, Mondays differed significantly from the other four weekdays, presumably because the practice — as is the case with most — was closed for appointments over the weekend. Arber and Sawyer suggested that more appointments should be kept open on Mondays, but gave no means of specifying how many more.[4] The data collected in this study allow the degree to which Mondays differed to be quantified, but the result is likely to be specific to this particular practice.

Campbell and Howie pointed out that the total number of appointments needed per week depends on demand, which reflects not only the patient list size but also the consultation rate. This rate may vary from around two to more than four attendances per patient per year, depending on the location of the practice and levels of social deprivation.[10] They suggested 63 slots were required at the start of Monday morning in their inner-city Edinburgh practice of 5600 patients. Their estimate is much higher than the minimum number of 26 calculated for this larger but less deprived practice, but was not derived from the same systematic collection of data.[10] Each practice must carry out its own analysis to derive meaningful minimum numbers of available appointments required at the start of the day. The generalizability of this method rests on the assumption that a predictable relationship between available appointments and 'extras' seen holds in other settings.

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Acknowledgements

Address for correspondence

Professor Tony Kendrick, Aldermoor Health Centre, Aldermoor Close, University of Southampton, SO16 5ST.