

# Clinic appointment reminders and their effect on attendance rates and HbA<sub>1c</sub> in a paediatric diabetes clinic

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**Mobile phone intervention can be effective in improving clinic attendance rates in people with long-term conditions and has been linked to a reduction in HbA<sub>1c</sub> in adults with diabetes. In this prospective, crossover study, the authors sought to determine the effects of telephone- and text-based reminders on clinical attendance in a paediatric diabetes population. Data on 104 children and young people were analysed. Compared with a control period in which no reminders were sent, DNA rates were lower in both the telephone arm and the text message arm; however, the reduction was only significant in the former. The authors discuss reasons for non-attendance in paediatric clinics and how they differ from those in adults. More innovative measures are needed to address non-attendance, especially given that higher attendance rates were associated with lower HbA<sub>1c</sub>.**

Clinic non-attendance in the health service is a significant problem, particularly in the follow-up of people with long-term conditions. It leads to poor use of resources and affects condition management, resulting in suboptimal outcomes (Dockery et al, 2001). National did-not-attend (DNA) rates vary between specialties; in 2015, the overall outpatient DNA rate was 8.21%, while in paediatric diabetes medicine it was even higher, at 11.26% (NHS, 2016). It is estimated that missed appointments cost the NHS £225 million in 2012–13 (National Audit Office, 2014), as well as increasing waiting times for patients. The 2015 DNA rate for paediatric diabetes in Doncaster and Bassetlaw Hospitals NHS Foundation Trust was 9.31%, above the average rate of 8.90% for other specialties within the same Trust.

A number of methods have been used to improve clinic attendance rates, including telephone calls, text-based prompts, financial incentives and issuing a copy of the referral

letter to the attendees (Osinowo et al, 2010). A recent Cochrane review, which included eight randomised controlled trials and a pool of nearly 7000 participants, showed a significant improvement in clinic attendance following text messages and phone call reminders (Gurol-Urganci et al, 2013). The cost of each text message was between half and two-thirds of the cost of making a phone call. Potential loss of privacy for patients and issues around patient confidentiality were not reported.

A systematic review of text-based reminders showed that they seem to be equally effective in hospital and primary care settings, and in people of different age groups, with an overall odds ratio for attendance of 1.48 (95% confidence interval, 1.23–1.72) and no significant differences between subgroups (Guy et al, 2012). In paediatric settings, attendance is reliant primarily on parents or carers remembering to bring children and young people (CYP) to an appointment, except perhaps in the late teenage years.

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## Article points

1. In this crossover study, phone- and text-based reminders had a small effect on clinic attendance compared with no reminders; however, the difference was only significant with the phone intervention.
2. Increased clinic attendance rates over an 8-month period was associated with lower mean HbA<sub>1c</sub>.
3. Text and telephone reminders appear to have a smaller effect on attendance in children and young people with diabetes than in adults. Other methods to improve attendance may be required in this population.

## Key words

- Attendance
- Clinic reminders
- HbA<sub>1c</sub>
- Paediatric diabetes

## Authors

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### Page points

1. In a previous pilot study, appointment reminders by text message or telephone were found to reduce non-attendance rates over a period of 9 months at the authors' clinic.
2. Following those results, the current prospective study was conducted to determine whether these findings were sustained over a longer period of 2 years.
3. Participants received telephone reminders 1–3 days prior to their appointment for 8 months, followed by text message reminders for a further 8 months, and comparisons were made with routine procedure over the 8 months prior to the interventions.

Irrespective of age, attendance at diabetes clinics is a particular challenge, with DNA and cancellation rates of up to 20% (Gill and Owens, 1998). Several studies have shown a direct correlation between poor attendance and glycaemic control (Jacobson et al, 1991; Masding et al, 2010). A recent survey looked at reasons for non-attendance in adults with type 1 diabetes and strategies to improve this. Suggestions from participants included not booking appointments too far ahead, sending text or email reminders and specifying a contact number or email address to which any request for appointment changes could be directed (Akhter et al, 2012).

In a pilot study conducted at our paediatric diabetes clinic over a period of 9 months, we compared DNA rates with the published national average and investigated ways to improve attendance (Natarajan et al, 2008). We compared attendance rates in CYP/parents who were sent either a standard outpatient letter (control arm) or an appointment reminder via either telephone or text message prior to the appointment (intervention arms). The results indicated that our clinic had a DNA rate of 22% (control arm). In the telephone intervention arm, the DNA rate dropped to 14%, with a further drop to 8% if the CYP were spoken to directly rather than their parents or carers. Text message reminders also resulted in improved DNA rates of 16%. The reasons given for non-attendance included forgetting the date (more than a third of participants), "not feeling well", administrative errors, and family and work commitments.

Following on from this pilot, we decided to conduct a further study to find out whether the improvement in attendance rates was sustained over a longer period of time. The aims of the study were as follows:

1. To compare DNA rates between the control and intervention arms.
2. To assess the association between attendance rates and glycaemic control (HbA<sub>1c</sub>).

### Methods

CYP with diabetes are usually seen a minimum of four times a year in our hospital outpatient setting. Those who had a recent diagnosis of

diabetes (less than 6 months) were excluded from the study, as the number of appointments, support provided and education are very different in the first few months after diagnosis.

This was a prospective 2-year study in which the first 8 months (May to December 2008) served as the control arm, with routine hospital appointments made by parents/carers or CYP when leaving clinic and confirmed by a letter from the hospital a few weeks later. In the next 8 months (intervention arm 1), parents or CYP received a telephone reminder 24–72 hours prior to the appointment by the diabetes specialist nurses. If the phone call was not answered, a message was left on the answering machine if such a facility existed. A maximum of two such attempts were made to contact the family. In the last 8 months (intervention arm 2), a text message reminder was sent 24–72 hours before the clinic appointment. Texts were sent to both the parent and the CYP if numbers were available for both. A text was considered "sent" if a delivery report was received. It was also documented if a reply was received. The phone and text reminders were sent in addition to a standard invitation letter that was sent routinely from the hospital.

Demographics, including contact details, a list of clinics offered in each of the three study periods, the type of contact made in the intervention arms, clinic attendance and HbA<sub>1c</sub> were recorded. As this was a service evaluation, ethics committee approval was not necessary.

### Statistical analysis

DNA rates (the number of DNAs divided by the total number of planned clinic appointments) and the number of CYP with no DNAs by intervention arm were compared using chi-squared tests. Overall glycaemic control, as reflected by average HbA<sub>1c</sub>, was compared between groups using *t*-tests.

The association between DNA rates and glycaemic control was modelled using multivariable linear regression adjusting for age, gender, duration of diabetes and treatment (multiple daily injections, twice-daily injections or insulin pump therapy). A multi-level model was used to account for repeated measures within individuals.

## Results

Data were collected for 104 CYP (55 boys) attending the paediatric diabetes clinic between May 2008 and May 2010. Attendance information was available for 90 CYP in period 1, 102 in period 2 and 99 in period 3. HbA<sub>1c</sub> data were available for 90 CYP in period 1, 102 in period 2 and 92 in period 3. At the start of this study, 11 CYP were on insulin pump therapy, three were on twice-daily mixes and 16 were using a combination of rapid-acting insulins, premixed insulins and long-acting insulins. The rest ( $n=74$ ) were on a basal-bolus regimen. The average duration of diabetes was 3.5 years (range, 6 months to 13 years).

### DNA rates in the control and intervention periods

Overall, compared with the control period, DNA rates were lower in both the phone period and the text message period; however, the reduction was only significant in the phone period ( $P=0.05$  and  $P=0.098$  for the phone and text periods, respectively; *Table 1*).

A median of three clinics were planned for each participant in each 8-month period. The percentage of CYP with no DNAs was slightly higher in the phone period (80.4%) and in the text period (81.8%) compared with the control period (76.0%); however, the differences were not significant (*Table 2*).

### Association between attendance rates and HbA<sub>1c</sub>

After adjusting for significant predictors of HbA<sub>1c</sub> (gender, age and duration of diabetes), multi-level linear regression showed that CYP who attended more clinics had better control. For each additional clinic attended, HbA<sub>1c</sub> decreased by an estimated average of 3.3 mmol/mol (0.3%;  $P=0.004$ ). CYP who attended three or more clinics per 8-month period had an average HbA<sub>1c</sub> of 70 mmol/mol (8.6%), while those who attended two or fewer clinics had an average HbA<sub>1c</sub> of 75 mmol/mol (9.0%; *Figure 1*).

## Discussion

Our study shows that, although attendance rates were slightly improved during the phone and text

**Table 1. Number of clinics planned, attended, cancelled and missed in each study period.**

Clinic appointment	Control period	Phone period	Text period
Planned	282	305	297
Attended	214 (76%)	240 (79%)	228 (77%)
Cancelled	34 (12%)	37 (12%)	47 (16%)
Did not attend	34 (12%)	28 (9%)*	22 (7%)

\* $P=0.05$  compared with the control period.

**Table 2. Number of participants achieving specific DNA rates in each study period.**

DNA rate	Control period	Phone period	Text period
0%	68	82	81
>0–25%	9	5	5
>25–50%	10	13	11
>50%	3	2	2
<b>Total</b>	<b>90</b>	<b>102</b>	<b>99</b>

DNA rates defined as the number of DNAs divided by the number of planned clinics.

DNA=did not attend.

message intervention periods, these interventions had no significant overall effect on DNA rates. This finding is in contrast to research in adults performed by Liew et al (2009), which showed that telephone reminders and text messaging can serve as effective tools for improving attendance at clinic appointments. This may reflect a difference in the efficacy of telephone and text message reminders between adults, who receive the messages for their own appointments, and CYP, who are reliant on their parents/carers receiving the reminder. This theory is supported by our observation that the reminder system was more effective in reducing DNA rates in young people who received the reminder themselves and were able to respond independently. Another factor to take into consideration is that Liew et al (2009) had a much larger number of participants in their study, so it may be that our study did not have enough participants to detect a significant change.

Kaufmann et al (1999) observed that good

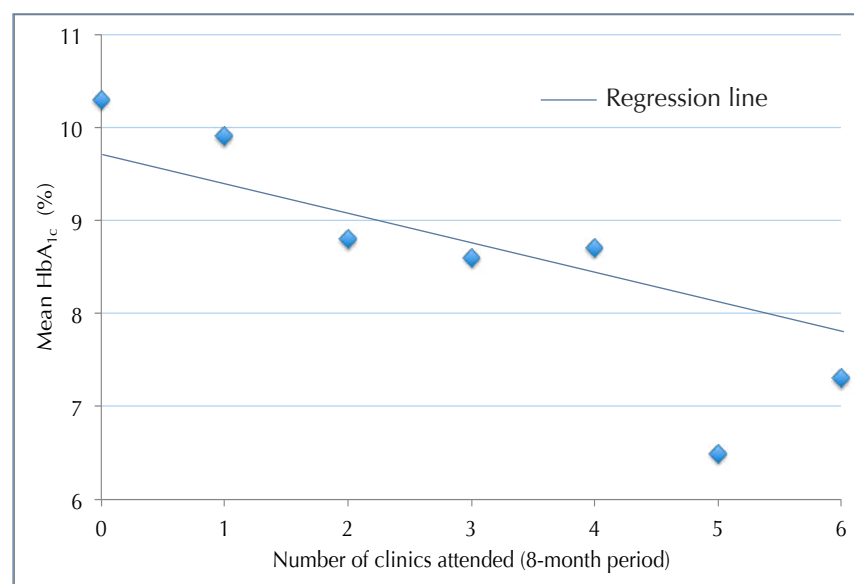


Figure 1. Association between number of clinics attended and mean glycaemic control (HbA<sub>1c</sub>).

### Summary of results

1. Did-not-attend rates fell from 12% in the control period to 9% in the telephone period and 7% in the text message period. However, the difference was only significant with the telephone intervention.
2. The proportion of participants with 100% attendance rates increased from 76.0% in the control period to 80.4% and 81.8% in the telephone and text message periods, respectively. However, the differences were not significant.
3. Clinic attendance rates were associated with better glycaemic control, with average HbA<sub>1c</sub> reductions of 3 mmol/mol (0.3%) per each additional clinic attended over the 8-month intervention periods.

clinic attendance is associated with better glycaemic control. In our population, we saw an average improvement in HbA<sub>1c</sub> of 4 mmol/mol (0.4%) in CYP who attended three or more clinics in an 8-month period compared with those who attended two or fewer clinics. While it is not possible to draw conclusions about causation from this study, other work has clearly shown that non-attendance relates to poor glycaemic control (Jacobson et al, 1991; Masding et al, 2010).

Phone and text interventions are completely reliant on families providing us with up-to-date contact details, and these were checked at each clinic appointment. However, the nature of mobile communication in today's society is such that people may change telephones and numbers frequently. Another issue is that the use of mobile communications relies on the device being adequately charged, in service and, in the case of the text messaging intervention, having enough credit for the recipient to reply.

The sequential design of this study may also have led to some confounding, as improved attendance in the texting period may have been related to a gradual improvement in attendance over time as a result of continual reminders; that is, there may have been residual effect from receiving telephone reminders that affected results in the text messaging arm.

This confounding factor could be avoided by performing a randomised controlled trial with three arms.

The *Health Service Journal* (2010) showed that there is seasonal variability in DNA rates, with higher rates of appointments missed in the months of December to March compared with the rest of the year. As our trial had a prospective crossover design, it may have been confounded by seasonal variation in DNA rates. Gatrad (2000) also showed that the timing of Ramadan (September in 2009, when this study was carried out) could have a significant impact on clinic attendance in Muslim communities. However, the 2011 UK census showed that only 1.7% of our community identified as Muslim, so the effect of this on our results is likely to be limited.

We ensured that all our families had the opportunity to experience the different ways we could contact them through the sequential design of this study. We were often able to involve the young people directly via a telephone or text message to remind them of their upcoming appointments, when appropriate. This can help to encourage independence and self-efficacy in taking responsibility for their medical management.

Although text messaging and phone reminders did not significantly improve clinic attendance rates in our study, text messages in particular are a relatively cheap and simple intervention to incorporate within the diabetes team practice. It is also becoming possible to set up automated text messaging via NHS mail (see the NHS Mail mini guide, available at: <http://bit.ly/1YwxIMh>), with the facility for CYP/families to rearrange the appointment as soon as they receive the message. This is already being practised in several hospitals. Other measures to consider may include targeting the young people themselves in addition to the parents/carers.

### Conclusions

It is clear that increased attendance at clinic is associated with better glycaemic control. The Best Practice Tariff (BPT) has made it mandatory for all CYP to be offered at least four clinics with the multidisciplinary team per year, but ensuring attendance at these clinics is a challenge.

Phone and text message reminders have been successful in helping to reduce DNA rates in adult populations. Paediatric diabetes teams need to use these and other innovative ways to engage with both CYP and their parents/carers to improve clinic attendance, leading to better outcomes. This will become even more important as the BPT becomes less process-driven and more outcomes-oriented (Randell, 2012). ■

### Author contributions

PS and EG researched and collected the data. PS and SLM wrote the manuscript. KH analysed the data and edited the manuscript. AN devised the idea and edited the manuscript.

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Anuja Natarajan is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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