

ORIGINAL ARTICLE

Increasing chlamydia test of re-infection rates using SMS reminders and incentives

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ABSTRACT

Background Clients diagnosed and treated for *Chlamydia trachomatis* are a recognised high-risk group for subsequent infection. An estimated 8% of clients treated for chlamydia at Cairns Sexual Health Service return for re-testing within the recommended 3–4-month period. There is no recall or reminder system in place. This study assesses the effectiveness of using short messaging service (SMS) reminders with and without incentive payments to increase re-testing rates.

Methods Eligible consenting clients were randomly allocated to one of three groups. Group 1 (controls) received the standard advice from the clinician to return for re-testing in 3–4 months. Group 2 received the standard advice and an SMS reminder at 10–12 weeks post-treatment. Group 3 received the standard advice and the SMS reminder, which also offered an incentive payment on clinic attendance.

Results 32 participants were recruited to groups 1 and 2 and 30 participants to group 3. 62 SMS reminders were sent with 13 (21.0%) reported as undelivered. Re-testing rates were 6.3%, 28.1% and 26.7% for groups 1, 2 and 3, respectively.

Conclusion SMS reminders with or without an incentive payment increased re-testing rates in our clients who were diagnosed and treated for chlamydia. However, re-testing remained less than ideal, and the high rate of undelivered SMS reminders suggest that this intervention alone will not achieve desired re-testing rates and that a range of strategies will be required to increase re-testing in this population.

INTRODUCTION

Chlamydia trachomatis is the most frequently notified infection in Australia, with 74 305 newly diagnosed infections reported in 2010.¹ The population rate of reported diagnoses in both men and women has more than tripled over the past 10 years.¹ Untreated infections can have serious sequelae, most notably pelvic inflammatory disease in women, which can lead to chronic pelvic pain, ectopic pregnancy and infertility.² Re-infection with chlamydia increases the risk for pelvic inflammatory disease and ectopic pregnancy in women³ and has been associated with increased risk of HIV seroconversion in men who have sex with men.⁴

Previous chlamydial infection as a predictor of subsequent infection in both men and women has been well documented^{5–8} and supports Australian clinical guideline recommendations of re-testing

3 months after a chlamydia diagnosis.^{9–10} There is a paucity of literature documenting re-testing rates; however, a recent paper from the Australian Collaboration for Chlamydia Enhanced Sentinel Surveillance (ACCESS) reports an overall 14.1% re-testing rate across a 4-year period from the sexual health service network.¹¹ The ACCESS Family Planning Network reported a 12.7% re-testing rate in individuals aged 16–29 years during 2008 and 2009.¹² Cairns Sexual Health Service (CSHS) clients diagnosed with chlamydia are advised by a clinician at the time of treatment to return for re-testing in 3–4 months; however, CSHS has no recall or reminder system in place.

Short messaging service (SMS), also known as text messaging, transmits messages to mobile telephones and is an effective method of communicating appointment reminders and reducing 'did not attend' rates in outpatient settings.^{13–14} Financial incentives have been shown to increase patients' compliance with healthcare treatment.¹⁵ The only study documenting the use of financial incentives to encourage clients to return for chlamydia re-testing showed little effect.¹⁶ However, the lack of effect of incentives in this study may result from the long time period from time of enrolment when incentives were discussed and the re-testing visit. In this study, we assessed the effectiveness of using SMS reminders with and without a financial incentive to increase re-testing rates in clients diagnosed with chlamydia at the CSHS.

METHODS

Clients attending the CSHS for treatment of chlamydia or who presented with genital symptoms (genital ulceration, vaginal discharge, abnormal vaginal bleeding, pelvic pain, dysuria) or who were a contact of someone diagnosed with chlamydia and who were aged at least 16 years, were residing in Cairns for the next 6 months, had access to a mobile telephone and were willing to receive an SMS reminder for a chlamydia test were invited to participate. HIV-positive clients were excluded as their regular HIV clinic appointments could influence re-testing patterns.

After recruitment, the chief investigator consecutively allocated study participants to a randomised list of numbers 1–3, generated using Excel software. Neither the clinicians recruiting the participants nor the participants themselves were informed of the randomisation outcome. Participants in group 1 (controls) received the standard

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advice from clinicians to return for re-testing in 3–4 months. Group 2 participants received the standard advice and a SMS reminder at 10–12 weeks post-treatment, and group 3 participants received the standard advice and an SMS reminder at 10–12 weeks post-treatment, which also offered a \$10 incentive payment on return to the clinic. Clients recruited but subsequently found not to have a chlamydial infection were withdrawn from the study.

A clinic mobile telephone was set up with the SMS reminder templates '3 mths r up, drop in 4 a checkup or call 40506205 for an appointment' and '3 mths r up, drop in 4 a check-up or call 40506205 for an appt & get \$10'. SMS reminders were manually sent on Mondays, or Tuesdays if Monday was a public holiday, for all participants due for a reminder in the coming week. Delivery reports were received. The messaging system would intermittently attempt to deliver an SMS reminder for up to 7 days before it was reported as 'undelivered'.

Participants had a range of options for re-testing—a booked appointment or a walk-in appointment where they were reviewed by a member of nursing staff or they could simply provide a urine sample (arranged by the reception staff) without a formal clinical review. Participants were considered 're-tested' if they had a chlamydia test between 10 and 16 weeks post-treatment.

During 2008, CSHS diagnosed approximately 120 chlamydia infections in clients residing in the Cairns area, with an estimated 8% re-testing within 3–4 months. Sample size calculations were made based on this information. To detect a 10% absolute difference in re-testing rates between group 1 and group 2, and between group 1 and group 3, 30 participants were required in each group (power =80%, α =5%).

The χ^2 test was used to compare characteristics of participants in each group and to assess associations with an undelivered SMS reminder. We calculated the proportion of participants in each group re-tested and used a χ^2 test (two-sided Fisher's exact) to determine if there was a significant difference in re-testing rates. Both an intention-to-treat analysis and a per-protocol analysis were conducted. Stata statistical software (V.10) was used to conduct all analyses.

Ethical approval for this study was obtained through the Cairns and Hinterland Health Service District Human Research Ethics Committee.

RESULTS

Between January 2010 and March 2011, 161 clients were invited to participant in the study, of whom 94 were identified as having chlamydia infection and were followed throughout the re-testing period—32 participants in groups 1 and 2 and 30 participants in group 3.

Fifty-nine (62.8%) participants were aged <25 years, 28.7% identified as being Aboriginal and/or Torres Strait Islander and there was a similar proportion of men and women. There was no statistically significant difference in characteristics between the three groups (table 1).

Sixty-two SMS reminders were sent with 13 (21.0%) reported as undelivered. Seven of the 13 participants (53.8%) with undelivered SMS reminders identified as Aboriginal and/or Torres Strait Islander. This association was statistically significant ($p=0.047$). There was no association between sex or age group and undelivered SMS reminders.

Chlamydia re-testing rates among group 1 (controls) were 6.3%, and using an intention-to-treat analysis, group 2 (SMS reminders) had a re-testing rate of 28.1% and group 3 (SMS reminders and incentive) a 26.7% re-testing rate (table 2). Of the

Table 1 Participant characteristics by study group

| | All (n=94) n (%) | Group 1 (n=32) n (%) | Group 2 (n=32) n (%) | Group 3 (n=30) n (%) | p Value |
|-------------------|------------------------|----------------------------|----------------------------|----------------------------|---------|
| Sex | | | | | |
| Male | 46 (48.9) | 14 (43.8) | 16 (50.0) | 16 (53.3) | 0.744 |
| Female | 48 (51.1) | 18 (56.3) | 16 (50.0) | 14 (46.7) | |
| Age group (years) | | | | | |
| <25 | 59 (62.8) | 20 (62.5) | 18 (56.3) | 21 (70.0) | 0.534 |
| ≥25 | 35 (37.2) | 12 (37.5) | 14 (43.8) | 9 (30.0) | |
| Indigenous status | | | | | |
| ATSI | 27 (28.7) | 10 (31.3) | 9 (28.1) | 8 (26.7) | 0.387 |
| Non-ATSI | 61 (64.9) | 20 (62.5) | 19 (59.4) | 22 (73.3) | |
| Not stated | 6 (6.4) | 2 (6.3) | 4 (12.5) | 0 (0.0) | |

19 participants who re-tested, 3 (15.9%) were found to have a chlamydial infection. There was a significant difference in re-testing rates between group 1 and both group 2 ($p=0.043$) and group 3 ($p=0.040$) in this analysis.

In the per-protocol analysis with exclusions of those who did not re-test within the defined 10–16 week post-treatment period and those with an undelivered SMS reminder or who re-tested for chlamydia prior to being sent an SMS reminder, none of group 1 participants re-tested, 5 (22.7%) of group 2 and seven (29.2%) of group 3 participants were re-tested (table 3, figure 1). Of these 12 participants who re-tested, two (16.6%) had a chlamydial infection. There was a significant difference in re-testing rates between group 1 and both group 2 ($p=0.010$) and group 3 ($p=0.002$) in this analysis.

DISCUSSION

This is the first Australian study assessing the effectiveness of SMS reminders with and without incentive payments to increase re-testing rates following a chlamydia diagnosis. SMS reminders with or without an incentive payment increased re-testing rates when compared to no SMS reminder. Another notable finding is that despite the success of the SMS intervention, 21% of SMS reminders were undelivered.

SMS reminders with and without an incentive payment significantly increased chlamydia re-testing rates to 26.7% and 28.1%, respectively. Various other strategies to increase re-testing rates after a chlamydia diagnosis have been trialled, also with moderate success.^{16–18} Paneth-Pollak *et al*¹⁸ found that the use of postcard reminders increased re-testing rates from 7.7% to 14.1%. Malotte *et al*¹⁶ trialled a number of strategies concluding that a telephone call was the most effective method and similar to our study that monetary incentives did not increase re-testing rates compared with a brief recommendation. Despite the seeming lack of benefit from small incentive payments being provided with SMS influencing re-testing rates compared with SMS alone, this result must be viewed with caution due to the

Table 2 Comparison of chlamydia re-testing by study group (intention-to-treat analysis)

| | Not re-tested n | Re-tested n | Re-tested % (95% CI) | p Value |
|---|--------------------|----------------|-------------------------|---------|
| Group 1 controls (n=32) | 30 | 2 | 6.3 (0.8 to 20.8) | |
| Group 2 SMS reminder (n=32) | 23 | 9 | 28.1 (13.8 to 46.6) | 0.043 |
| Group 3 SMS reminder and incentive (n=30) | 22 | 8 | 26.67 (12.3 to 45.9) | 0.040 |

Table 3 Comparison of chlamydia re-testing by study group (per-protocol analysis)

| | Not re-tested n | Re-tested n | Re-tested % (95% CI) | p Value |
|---|-----------------|-------------|----------------------|---------|
| Group 1 controls (n=30) | 30 | 0 | 0 | |
| Group 2 SMS reminder (n=22) | 17 | 5 | 22.7 (8.8 to 43.4) | 0.010 |
| Group 3 SMS reminder and incentive (n=24) | 17 | 7 | 29.17 (12.6 to 51.1) | 0.002 |

small sample size in our study. The highest re-testing rates were reported by Sparks *et al*¹⁷ where clients were contacted 10 weeks after treatment and offered the option of returning to the clinic or being sent a postal specimen collection kit to mail back. However, this was a small study and involved a personal telephone call to enrol participants, an intervention within itself. Importantly, 42% of potentially eligible participants were unable to be contacted for possible enrolment.

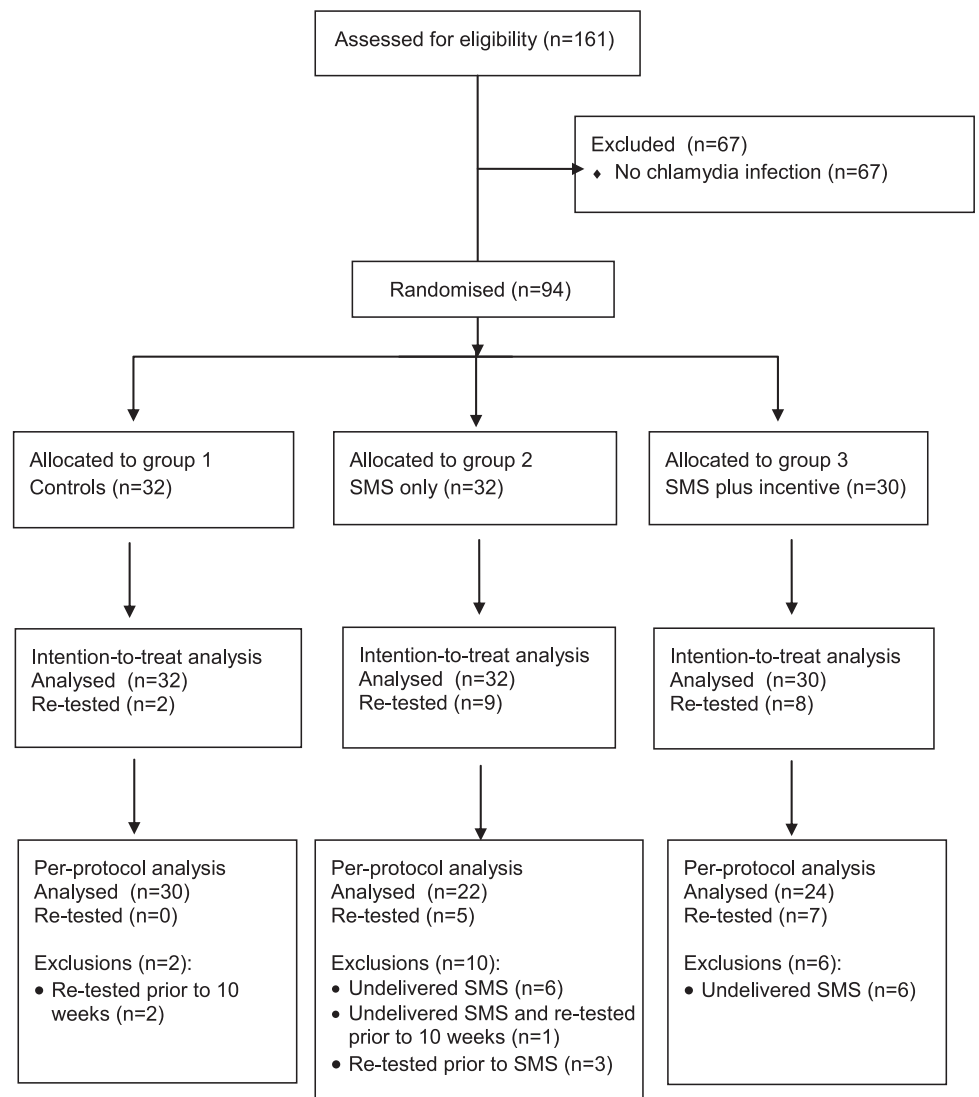
A study measuring re-testing across Australia's sexual health services (the ACCESS study network) between 2004 and 2008 showed no significant increasing trend in re-testing suggesting that any interventions to increase re-testing have had minimal

success.¹¹ A wide range of re-testing rates, 5.7%–32.0%, was reported across the 19 reporting clinics. A more in-depth analysis is required to determine if this variation is a reflection of the different client populations accessing these clinics or specific re-testing interventions. The ACCESS analysis included the entire clinic population, whereas our study had specific inclusion and exclusion criteria making direct comparison problematic.

An important finding from this study is that 21.0% of SMS reminders were undelivered despite the mobile telephone numbers being current at the time of enrolment 10–12 weeks prior. If the recipient's mobile telephone is turned off, out of range or has a full-text message inbox, the message may not be received immediately. However, as the messaging system attempted to deliver the SMS reminder for a period of time before reporting it as undelivered, it is more likely that the recipient's telephone had been deactivated or suspended. Reasons for deactivation or suspension of a mobile telephone include non-payment of a post-paid service, the telephone being reported as lost or stolen, transfer of the number to a different service provider or not recharging within a defined time period.

Despite small numbers in this study, there was an association between an undelivered SMS reminder and clients identifying as Aboriginal and/or Torres Strait Islander. The reasons for this are unclear; however, it is particularly important given Aboriginal

Figure 1 Flow of participants.



Key messages

- ▶ SMS reminders with incentive payments significantly increased re-testing rates; however, rates remained less than ideal.
- ▶ A high proportion of SMS reminders were 'undelivered', and effectiveness of this intervention in different population groups should be evaluated.

and Torres Strait Islander people are a known high-risk group for chlamydia infection. A greater understanding of mobile telephone usage in key population groups is required to determine if this intervention would be suitable for re-testing reminders.

Despite the relative success of this intervention, neither intervention group achieved a re-testing rate >28.1%. In a non-study environment, this rate could be even lower as clinicians may not place the same emphasis on re-testing as they might have during this study. Additional systems for recall such as telephone, email or postcard reminders and options for mail-out testing kits where clinic re-attendance is not required may improve re-testing rates. Offering a range of reminder and re-testing alternatives would enable clients to determine the option best suited to their circumstances and should be considered. Motivational interviewing and greater emphasis on the importance of re-testing by the clinician at the time of treatment should also be further investigated.

This study has some limitations. A larger sample size would have enabled analysis of associations between participant characteristics and between group 2 (SMS reminder) and group 3 (SMS reminder plus incentive) re-testing rates. Although participant characteristics across the three groups were broadly similar, the small sample size and numerical differences between the groups could have influenced the results. Additionally, the CSHS relocated during the study period, and this may have influenced whether participants returned for re-testing or not. Finally, the high proportion of undelivered SMS messages was unexpected.

Recall/reminder systems using SMS technology provide a simple effective method to target high-risk groups for re-testing and should be considered an integral tool in modern health services. A larger study to determine the impact incentive payments in combination with SMS reminders have on re-testing rates would be valuable in guiding future strategies. However, the high rate of undelivered SMS reminders indicates that this intervention alone will not achieve desired re-testing rates and its effectiveness in different population groups should be evaluated. The less than optimal re-testing rates achieved in previous studies also suggest that a combination of innovative interventions will be required to increase re-testing in this population.

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HM: (1) acquisition of data, (2) revising the article critically for important intellectual content and (3) final approval of the version to be published. DP: (1) acquisition of data, (2) revising the article critically for important intellectual content and (3) final approval of the version to be published. DBR: (1) substantial contribution to conception and design and acquisition of data, (2) revising the article critically for important intellectual content and (3) final approval of the version to be published. MH: (1) substantial contribution to conception and design and analysis and interpretation of data, (2) revising the article critically for important intellectual content and (3) final approval of the version to be published.

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