Clinician education, advice and SMS/text reminders improve test of reinfection rates following diagnosis of *Chlamydia trachomatis* or *Neisseria gonorrhoeae*: before and after study in primary care

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ABSTRACT

Background Evidence-based guidelines for the management of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* recommend testing for reinfection 3–6 months following treatment, but retesting rates are typically low.

Methods Participants included six primary care clinics taking part in a pilot study of strategies designed to improve partner notification, follow-up and testing for reinfection. Rates of retesting between 6 weeks and 6 months of a positive chlamydia or gonorrhoea diagnosis were compared across two time periods: (1) a historical control period (no systematic approach to retesting) and (2) during an intervention period involving clinician education, patient advice about reinfection risk reduction and retesting, and short messaging service/text reminders sent 2–3 months post-treatment inviting return for retesting. Retesting was calculated for demographic subgroups (reported with 95% CI).

Results Overall 25.4% (61 of 240, 95% CI 20.0 to 31.4) were retested during the control period and 47.9% (116 of 242, 95% CI 43.2 to 55.1) during the intervention period. Retesting rates increased across most demographic groups, with at least twofold increases observed for men, those aged 20–29 years old, and Māori and Pasifika ethnic groups. No significant difference was observed in repeat positivity rates for the two time periods, 18% (11 of 61) retested positive during the control and 16.4% (19 of 116) during the intervention period (p>0.05).

Conclusions Clinician and patient information about retesting and a more systematic approach to follow-up resulted in significant increases in proportions tested for reinfection within 6 months. These simple strategies could readily be implemented into primary healthcare settings to address low rates of retesting for bacterial sexually transmitted infections.

Trial registration number ACTRN12616000837426.

Key messages

- Clinician and patient information about retesting and a short messaging service/text reminder were associated with increased retesting rates among primary care attendees.
- Retesting rates increased across most demographic groups, with at least twofold increases observed for men, those aged 20–29 years old, and Māori and Pasifika ethnic groups.
- These simple strategies could be widely implemented in primary healthcare settings as a way to improve timely detection and treatment of chlamydia and gonorrhoea reinfection.

INTRODUCTION

Untreated repeat infection with *Chlamydia trachomatis* or *Neisseria gonorrhoeae* increases the risk of serious reproductive sequelae, including pelvic inflammatory disease, ectopic pregnancy and tubal factor infertility.[1] Failure to treat current sexual partners increases the likelihood of reinfection among index

cases.[1 2] Providing partner notification information and services, reinfection risk reduction advice and timely access to retesting play key roles in reducing onward transmission and the health consequences of undetected reinfection.[3 4]

Evidence-based guidelines for the management of sexually transmitted infections (STIs) recommend offering retesting following treatment for chlamydia or gonorrhoea at 3–6 months in New Zealand,[5 6] and at 3 months for those under 25 years old in the UK and the USA.[1 7] At the time of this study, guidelines used by primary care practitioners in New Zealand recommended a routine test of reinfection but not a routine test of cure (TOC) for chlamydia; TOC was advised only in certain circumstances (pregnancy, extragenital infection, ongoing symptoms).[5] For gonorrhoea, a TOC was recommended for those with persistent genital or anal symptoms 3–7 days after treatment and for pharyngeal site infection at 3 weeks after treatment.[5] Recommendations regarding treatments and TOCs for gonorrhoea are evolving internationally, and national STI guidelines are in the process of being updated in New Zealand.[8 9]

Available evidence suggests test of reinfection rates are typically low in primary care and community populations, with estimates ranging from 29% to 32% retested within 6 months in New Zealand,[10 11] 13%–17% within 3 months in England[12] and 19% within 3 months in the USA.[13] Low rates of retesting in New Zealand are in part reflective of low levels of clinician awareness about retesting guidelines and lack of systematic approaches to retesting.[14] Studies designed to improve retesting rates have trialled the use of short messaging service (SMS or text message) reminders and incentive payments, with most reporting modest improvements in retest uptake among sexual health clinic attendees.[15–18]

To determine whether rates of testing for reinfection could be improved in primary care settings, our intervention incorporated clinician education about retesting, verbal and written patient information, and implementation of an SMS/text reminder system. Our study assessed retesting rates in six primary care clinics before and during participation in a pilot study designed to assess the acceptability of strategies to improve partner notification and retesting.[19] Key findings from the partner notification pilot study have been reported separately[19]; this paper reports on retesting during the intervention compared with a historical control group.

METHODS

Setting and participants

Participants were six primary care clinics located in the Wellington region of New Zealand (population approximately 471 000).[20] Clinics included two youth health services (providing free healthcare to those under 25 years old), one student health service (free healthcare for enrolled students) and three general practice clinics (two low-fee clinics for high-needs clients and a low-fee Māori/indigenous health provider). Sexual health consultations are subsidised by the New Zealand Government for young people attending primary care services (the upper age limit varies between clinics from 20 to 24 years). Written consent was obtained from a designated authority at each participating clinic.

Clinics were selected from those diagnosing the highest annual case loads of chlamydia and gonorrhoea in the Wellington region in the 12 months to June 2015 (identified from a laboratory data extract but excluding family planning and sexual health services). Approximately 119 primary care services diagnosed at least one case of chlamydia or gonorrhoea in the 12 months to June 2015. Ten clinics were approached to participate, representing a range of clinic types serving priority populations who are disproportionately affected by STIs (youth, Māori and Pasifika people). Eight of the ten clinics agreed to take part in the baseline phase.[21] Funding permitted participation by six clinics in the subsequent intervention study, and this target was reached after approaching seven of the eight clinics (in no particular order). The clinic that declined participation was a mainstream general practice that cited capacity issues (ie, recent departure of key nurses) as a reason for declining. Data presented here relate to those six clinics with data collected in both study phases.

Patient and public involvement

Clinicians rather than their patients served as participants in this study.

Test of reinfection processes

During the baseline historical control phase, clinics had no systematic approach to retesting, clinicians did not routinely advise patients to retest and none had recall or reminder systems in place. Knowledge about the importance of retesting and the difference between a test of reinfection and test of cure was variable among clinicians.[14]

The intervention to improve test of reinfection rates was part of a pilot study conducted to test the acceptability and utility of strategies designed to facilitate partner notification and follow-up (including testing for reinfection).[19] During this period, research team members met with participating clinicians (nurses and doctors) to discuss guideline recommendations about best practice STI management including testing for reinfection.[5 6] Clinicians were encouraged to offer patients both verbal and written advice about reinfection risk reduction and the importance of retesting.[19] Phone follow-up calls undertaken to check on treatment compliance, risk of reinfection and partner notification outcomes also gave clinicians the opportunity to remind patients about retesting. Nominated ‘study

Table 1 Information provided to patients about reinfection and retesting

Source	Message content
Clinician's advice at treatment consultation and printed patient information sheet	Once treated, reinfection is less likely if you: 1. Finish taking all the tablets/treatment you've been given. 2. Avoid sex for 7 days following your treatment and your partners' treatment. 3. Tell your partner/sexual contacts from the last 2 months they might be infected so they need to get tested and treated. 4. Use condoms every time you have sex. 5. We recommend you retest in 3 months to make sure you haven't been infected again. Early treatment of reinfection can help prevent more serious health problems later on.
SMS/text reminder	'Hi (patient name). This is a reminder to let you know you are due for your 3 month follow-up test. Please phone 123 456 780 to book an appointment. Thanks, (Nurse name) at (Clinic name)'.

SMS, short messaging service.

nurses' in each clinic took responsibility for sending an SMS/text message to patients at 2–3 months post-treatment advising return for a test of reinfection. Table 1 presents information provided to patients about retesting during the intervention.

Data collection

Baseline historical control

A retrospective review of 240 electronic patient records (40 per clinic) for individuals diagnosed with chlamydia and/or gonorrhoea between September 2013 and February 2015 collected details about diagnosis, treatment and follow-up. National Health Index (NHI) numbers (a unique patient identifier assigned to all New Zealanders at birth that enables health record linkage)[22] were used to identify any subsequent chlamydia and gonorrhoea tests in the 12 months following diagnosis via a data match with testing records obtained from the laboratory providing diagnostic services to the Wellington region (where specimens are routinely tested for both chlamydia and gonorrhoea).

Intervention phase (systems in place to facilitate retesting)

Data were prospectively collected during the 9-month pilot study (July 2016–March 2017). To assess retesting outcomes, NHI linkage with laboratory testing data was used to identify subsequent chlamydia and gonorrhoea tests sought (anywhere in the Wellington region) up until the end of July 2017 for patients seen at participating clinics. The laboratory data set included NHI, gender, date of birth, visit date, type of specimen, result, requestor name (doctor, nurse) and requesting location (clinic).

Data analysis

The main outcome was the proportion of individuals retested between 6 weeks and 6 months post-treatment (by age, sex, ethnicity and clinic). Reinfection rates were calculated and compared across the two time periods. Proportions of the overall cohort retested for chlamydia and gonorrhoea infection in the two time periods were described, 95% CI calculated and χ^2 tests for significance performed (using OpenEpi.com). At baseline, all individuals included in this analysis had at least 6 months of follow-up. To meet project funding deadlines, follow-up data on subsequent testing for the intervention cohort were requested from the laboratory just prior to all patients reaching 6 months of follow-up time elapsed since the date treatment was given. This analysis was therefore limited to the first 85% (242 of 287) of patients diagnosed with STIs during the intervention study period who had complete follow-up.

RESULTS

Text reminder messages were documented as having been sent to 66.9% of patients in the intervention cohort (162 of 242). Of the 52 not sent a reminder message, 40 (mostly youth clinic) patients had already returned to the clinic before the reminder was due (10 of whom were retested before 6 weeks), and 12 were not sent a reminder for reasons including no mobile phone and inactive number. There was no documentation regarding a text reminder for 28 patients. The timing of text messages ranged from 28 to 173 days following treatment (median 89 days or 12 weeks). Of those retested within 6 weeks to 6 months, 28.4% returned before the text reminder was due (33 of 116), 9.5% were sent a text but had already been retested at a different clinic (11 of 116), 30.2% were retested within 1 month of the text being sent (35 of 116), 21.6% returned more than a month after the text was sent (25 of 116), and timing was unknown for the remaining 10.3% of patients (12 of 116).

Table 2 presents the proportions (with 95% CI) retested in each phase of the study. An almost twofold increase was observed in retesting, from 25.4% (95% CI 20.0 to 31.4) at baseline to 47.9% (95% CI 43.3 to 55.1) during the intervention. The biggest increases were observed for those aged 20–29 years old and Māori and Pasifika ethnic groups. There was variability between clinics in the extent to which retesting improved, with no change seen at the student health service where retesting rates were already high (52.5% vs 47.8%). Phone follow-up on treatment compliance and partner notification outcomes during the intervention successfully reached 181 of 242 patients, of whom 93 (51.4%) were retested during the recommended

Table 2 Characteristics of primary care patients receiving a TOR before and after the implementation of a text/SMS reminder system

	Historical control (no TOR process) Total n=240				Intervention (advice and SMS recall) Total n=242				
	Total	Retested 6 weeks–6 months*			Total	Retested 6 weeks–6 months*			χ^2 test
Patient characteristics	**n**	**n**	**%**	**95% CI**	**n**	**n**	**%**	**95% CI**	**P value**
Index infection									
Chlamydia (CT) only	223	60	26.9	21.2 to 33.2	223	109	48.9	42.1 to 55.6	<0.01
Gonorrhoea (NG) only	10	1	10.0	0.3 to 44.5	10	3	30.0	6.7 to 65.2	0.14
Both CT and NG	7	0	0	0 to 34.8	9	4	44.4	13.7 to 78.8	–
Gender									
Male	81	8	9.9	4.4 to 18.5	63	14	22.2	12.7 to 34.5	0.02
Female	159	53	33.3	26.1 to 41.2	179	102	57.0	49.4 to 64.3	<0.01
Age band (years)									
14–19	73	22	30.1	19.9 to 42.0	92	45	48.9	38.3 to 59.6	0.01
20–24	113	29	25.7	17.9 to 34.7	110	57	51.8	42.1 to 61.4	<0.01
25–29	28	4	14.3	4.0 to 32.7	22	8	36.4	17.2 to 59.3	0.04
30+	26	6	23.1	9.0 to 43.6	18	6	33.3	13.3 to 59.0	0.24
Ethnic group									
New Zealand Māori	74	21	28.4	18.5 to 40.1	76	43	56.6	44.7 to 67.9	<0.01
Pasifika	80	11	13.8	7.1 to 23.3	47	22	46.8	32.1 to 61.9	<0.01
European	65	18	27.7	17.3 to 40.2	89	41	46.1	35.4 to 57.0	0.05
Other†	21	11	52.4	29.8 to 74.3	30	10	33.3	17.3 to 52.8	0.10
Clinic									
Low-fee GP 1	40	4	10.0	2.8 to 23.7	23	7	30.4	13.2 to 52.9	0.03
Low-fee GP 2	40	9	22.5	10.8 to 38.5	21	9	42.9	21.8 to 66.0	0.05
Low-fee GP 3	40	8	20.0	9.1 to 35.6	34	18	52.9	35.1 to 70.2	<0.01
Youth 1	40	5	12.5	4.2 to 26.8	62	28	45.2	32.5 to 58.3	<0.01
Youth 2	40	14	35.0	20.6 to 51.7	79	43	54.4	42.8 to 65.7	0.02
Student health	40	21	52.5	36.1 to 68.5	23	11	47.8	26.8 to 69.4	0.37
SMS/text reminder									
Sent		n/a			162	71	43.8	36.1 to 51.8	–
Unable to send		n/a			10	4	40.0	12.2 to 73.8	–
Not sent (returned early)		n/a			42	30	71.4	55.4 to 84.3	–
Not documented		n/a			28	11	39.3	21.5 to 59.4	–
Total sample	240	61	25.4	20.0 to 31.4	242	116	47.9	41.5 to 54.4	<0.01

–, χ^2 test could not be performed with zero value.
*During the historical control period, an additional 7.9% (19 of 240, 95% CI 4.8 to 12.1) of patients had a subsequent test at 6 months or beyond (so did not meet the target of being retested within 6 months). Of those in the intervention cohort, a further 9.5% (23 of 242, 95% CI 6.1 to 13.9) had a subsequent test at 6–12 months.
†Other ethnicities include Asian, Middle Eastern, Latin American, African, Other and not known.
CT, Chlamydia trachomatis; GP, general practice; n/a, not applicable; NG, Neisseria gonorrhoeae; SMS, short messaging service; TOR, test of reinfection.

time period. A smaller proportion of those not reached for phone follow-up were retested (23 of 61, 37.7%).

No significant difference was observed in reinfection rates among those retested in the two study phases (p>0.05). In the baseline phase (total n=240), 18% of those retested were positive for chlamydia and/or gonorrhoea (11 of 61, 95% CI 9.4 to 30.0). During the intervention phase (total n=242), 16.4% of those retested were positive (19 of 116, 95% CI 10.2 to 24.4).

DISCUSSION

This study suggests that retesting for chlamydia and gonorrhoea can be increased by simple changes within clinical practice. Prior to the intervention, reinfection risk reduction advice was inconsistent and retesting

not routinely advised. During the intervention, clinicians were made aware of the importance of retesting, encouraged to give verbal and written advice about reinfection risk reduction, and a systematic recall process implemented using SMS/text reminders. Encouragingly, results suggested this method was appropriate and acceptable to priority groups (youth, Māori and Pasifika). Men made up a third of the cohort at baseline and only a quarter of the intervention cohort, and although retesting rates for men increased, overall rates of retesting remained low. Some patients were retested before the text message was due to be sent (probably as a result of opportunistic retesting when presenting for other reasons). Therefore it was not the text reminder alone, but the combination of clinician and patient information as well as the process set up to ensure retesting was routinely addressed with all patients that impacted on return rates.

To our knowledge, this is one of the first studies to report on use of a retesting intervention including an SMS/text reminder to improve retesting rates among primary care attendees—past studies have focused on sexual health clinic populations. Our 22% overall increase in retesting rates was similar to improvements seen in studies involving sexual health clinic attendees. In two Australian studies, retesting rates increased by 9% and 22% when text (SMS) messaging was introduced in two Australian studies,[15 16] and by 21% in a similar study conducted in the Netherlands.[18] Despite our small sample, reinfection rates observed among those retested in this study were similar with rates reported for all retesting carried out in the wider Wellington region in 2012–2015.[11]

Limitations of the study include the use of a before/after study design with a historical control group—we cannot therefore conclude that the overall increase in retesting was solely related to the intervention. The student health service already had high rates of repeat testing during baseline. Discussion with staff at that clinic suggested that repeat tests during baseline were indicative of frequent STI testing by the student population rather than routine recall for tests of reinfection. We were able to capture subsequent testing at different clinics within the study region (Wellington), but not any that may have occurred outside of the region. This was a pilot study undertaken to trial the acceptability of new STI management strategies, so patient numbers were relatively small and analyses restricted to univariate comparisons for demographic factors. The lack of apparent differences in reinfection rates in the control and intervention phases in the current study is difficult to interpret in the absence of sufficient data to compare demographic and behavioural characteristics of those diagnosed with subsequent infection. A much larger study would be required to answer questions about the characteristics of those returning/not returning for retesting and to determine whether more complete retesting coverage would yield higher, lower or similar overall rates of reinfection.

Prioritising strategies to detect and prevent reinfection among those diagnosed is an important yet underutilised component of STI control. This study suggested that the combination of clinician and patient education together with a text reminder to invite return for retesting had a positive impact on rates of retesting. SMS/text messaging is a convenient, low-cost and ubiquitous mode of communication among young people.[23] Most clinic patient management systems can accommodate sending text messages that can be autopopulated, and many clinics already use this method to communicate appointment reminders and test results.[23] This simple intervention could be readily implemented across primary care settings to improve timely detection and treatment of reinfection.

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Contributors All authors were involved in the design and conduct of the research. SBR led the study, participating in collation, analysis and interpretation of the data, and drafted the manuscript. SMG participated in project management, cleaning, collation and analysis of data, and revision of the manuscript. DH, KL, JK and SRHP participated in the interpretation of results and revision of the manuscript. All authors read and approved the final manuscript prior to submission.

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Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The Southern Health and Disability Ethics Committee (New Zealand) granted approval for baseline data collection (16 July 2015, 15/STH/109), and the Central Health and Disability Ethics Committee granted approval for the intervention study (1 April 2016, 16/CEN/38).

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