ORIGINAL ARTICLE

Facilitating chlamydia testing among young people: a randomised controlled trial in cyberspace

Melissa Kang, Arlie Rochford, Rachel Skinner, Adrian Mindel, Marianne Webb, Jenny Peat, Tim Usherwood

ABSTRACT

Objectives Chlamydia notifications have been rising in Australia for over a decade and are highest in young people. This study aimed to evaluate the impact of an internet-based intervention on chlamydia testing among young people 16–25 years.

Methods This randomised controlled trial, recruitment, data collection, study interventions and follow-up occurred entirely in cyberspace, facilitated by a website. Eligible participants were aged 16–25 years and resided in Australia. The intervention group received personalised emails inviting interaction about chlamydia testing, while the control group received regular impersonal emails. Primary outcome was self-reported chlamydia testing at 6-month follow-up; secondary outcomes were condom use and changes in knowledge and attitudes.

Results 704 young people completed baseline information, 40 were excluded and five withdrew prior to follow-up. The follow-up rate was 47.3% overall. In the intervention group, 40.6% (95% CI 30.7% to 51.1%) reported having had a chlamydia test at follow-up compared with 31.0% (95% CI 24.8% to 37.2%) in the control group (p=0.07). A per-protocol analysis found that those who engaged in email interaction were more likely to report chlamydia test uptake compared with those in the control group (52.5%, 95% CI 39.3 to 65.4% cf 31.0%, 95% CI 24.8% to 37.2%, p=0.002). There were no differences in secondary outcomes between groups.

Conclusions This is the first randomised controlled trial undertaken in cyberspace to promote chlamydia testing. E-technology may be useful in promoting chlamydia testing and healthcare seeking behaviour in young people.

INTRODUCTION

Among the sexually transmissible infections (STIs) other than HIV, chlamydia causes the greatest burden of disease globally.1 In Australia, notification rates for genital chlamydia infection have steadily increased over the past decade and are highest in women and men aged 15–24 years.2 In 2011, notification rates were 1445.3 per 100 000 among 15–19-year-olds and 1501.4 per 100 000 among 20–24-year-olds.2 Australia’s first National STI strategy 2005–2008 identified young people aged 16–25 years as a target group for chlamydia control and prevention.3 This study was one of several pilot projects to inform a national screening programme4 and aimed to evaluate an internet-based intervention to increase chlamydia testing.

INTRODUCTION

Among the sexually transmissible infections (STIs) other than HIV, chlamydia causes the greatest burden of disease globally.1 In Australia, notification rates for genital chlamydia infection have steadily increased over the past decade and are highest in women and men aged 15–24 years.2 In 2011, notification rates were 1445.3 per 100 000 among 15–19-year-olds and 1501.4 per 100 000 among 20–24-year-olds.2 Australia’s first National STI strategy 2005–2008 identified young people aged 16–25 years as a target group for chlamydia control and prevention.3 This study was one of several pilot projects to inform a national screening programme4 and aimed to evaluate an internet-based intervention to increase chlamydia testing.

METHODS

Study location and population

This was a randomised controlled trial (RCT) with 1:2 randomisation. Eligible participants were aged 16–25 years residing in Australia who had had penetrative sexual intercourse and who provided a valid email address. Eligibility was determined by self-report of these criteria.

The study setting was cyberspace. A website (http://www.getcluedup.com.au) was the vehicle for accessing the intervention and was developed in consultation with 20 youth consultants (16–25 years) who were recruited through professional and collegiate networks. Website content included information about chlamydia and testing but also addressed known gaps in knowledge and barriers to seeking help and provided service
directories and links (see web appendix 1). The website went live in March 2007 with recruitment into the study commencing simultaneously. Recruitment ceased in January 2008, but the website remains live. The website was promoted via paid advertising, existing youth websites, social networking sites and opportunistic media interviews. Google Analytics was used to monitor website traffic.

The website invited eligible visitors to participate in the study via a homepage banner and clickable tiles on the other webpages. These links took visitors to the participant information statement. Potential participants then entered a current email address and ticked a consent box. This third step took them to the baseline questionnaire housed within the website. The baseline questionnaire collected data on demographics, education/occupation, substance use, sexual history, previous STIs, knowledge about chlamydia and attitudes to chlamydia testing. Participants could go into a draw for an iPod® or a music store voucher if they completed all elements of the study.

Interventions
The intervention group received personalised emails from a clinician (sexual health nurse or doctor). A ‘personalised email’ was sent from the clinician’s mailbox, included the clinician’s name and position, and contained a link to their staff profile on the University of Sydney’s website. The email thanked the young person for their participation and said that the clinician would like to ‘chat about chlamydia and getting tested’. The participant was invited to ask questions and prompted with questions about testing knowledge. Young people who responded were then engaged appropriately: advice depended on the questions asked. Non-responders were sent weekly emails for 3 months and then monthly emails for another 3 months. All email communication to non-responders in this group remained personalised, as described above.

Participants assigned to the control group received an email sent from the project mailbox (‘Clued Up’), was signed ‘The Clued Up Research Team’ and did not mention a clinician by name. These emails thanked the young person for participation and stated that they would be sent a reminder email about their participation in the study every month for 5 months and a final questionnaire in 6 months. These emails were intended to enhance retention and completion of the final questionnaire but were not personalised. There was no interaction and no clinical advice provided.

Web appendix 2 gives examples of email interactions.

Outcomes
Follow-up took place 6 months after enrolment. Data were collected via an online questionnaire using similar questions to baseline on knowledge, attitudes, sexual history and chlamydia testing in the past 6 months. This questionnaire was accessed via a link sent by email from the clinician. Weekly email reminders were sent for 3 months to non-responders.

The primary outcome was self-report of having had a chlamydia test within the past 6 months. Secondary outcomes were changes in knowledge about chlamydia, attitudes towards chlamydia testing and frequency of condom use.

Sample size
A minimum of 320 participants in each group was required to detect at least an 8% positive difference in testing rates in the intervention versus control group with a power of 90% and significance taken at 0.05. A loss to follow-up of 10% in the intervention group and 50% in the control group was anticipated, giving a target sample size of 1000 (360 intervention and 640 control).

Randomisation
Allocation to intervention or control groups was done on a 1:2 ratio based on the anticipated loss to follow-up described above. For allocation, a computer-generated random number (1, 2 or 3) was obtained by the same clinicians who sent emails to study participants. The number ‘1’ allocated the young person to the intervention group and ‘2’ or ‘3’ to the control group. Allocation took place each time a young person was deemed eligible (downloaded data showed email address, eligible age, an Australian postcode and ticked ‘Yes’ to having had intercourse) without any other information about the participant being known.

Analysis and statistical methods
Both intention-to-treat (ITT) and per-protocol (PP) analyses were performed. Only a proportion of young people in the intervention group interacted with the clinician as per the study protocol, that is, engaged. Engagement was defined as having had a minimum of one response of any type from the young person within 3 months from enrolment. The intervention was only deliverable when engagement occurred, where it did not occur, there was a ‘failure to start the intervention’. Thus, comparisons between the engaged group and the control group constituted the PP analysis. We propose that the PP analysis provides an ‘explanatory investigation of efficacy’ and provides useful information.

Statistical analysis was performed with SPSS V.16 with the individual as the unit of analysis. Proportions are presented with 95% CIs. To assess differences at baseline between the intervention (all), engaged and control groups, independent samples’ t tests for the continuous variables and χ2 tests for the categorical variables were performed. χ2 Analysis was used to assess the statistical significance of differences in the primary outcome and in condom use between groups at follow-up. To adjust follow-up values for baseline values, analysis of covariance was used for knowledge questions and logistic regression for binary outcome measures.

The study was approved by the University of Sydney Human Research Ethics Committee and enrolled in the Australian New Zealand Clinical Trials Registry (ACTRN12607000582459).

RESULTS
Website traffic
Reliable data on website traffic for the first 3 months (March to May 2007) were unavailable due to technical problems. Traffic between June 2007 and January 2008 ranged from 2030 to 3584 unique visitors per month (see web appendix 3).

Sample
Seven hundred and four young people completed baseline information between March 2007 and January 2008 and were randomised. Recruitment was then stopped because of project timelines and budget constraints. Forty young people were subsequently excluded because their email addresses were invalid (all sent emails bounced). Five withdrew prior to follow-up. Three hundred and forty-seven participants did not respond to the 6-month follow-up request. Thus, 312 were included in the ITT analysis (see figure 1).

We compared baseline information between intervention (all), engaged and control groups. Of the baseline sample of 664
young people, 78.2% were female. The mean age of female participants (20.0 years) was significantly lower than the mean age of male participants (21.5 years), p<0.0001. There was a small significant difference between the engaged and whole intervention groups with respect to being born overseas. Those who engaged were more likely to have been born in Australia. However, of those born overseas in both groups, most were born in English-speaking countries.

Table 1 describes their demographic and sexual history characteristics. At baseline, 111/664 (16.7%, 95% CI 13.9% to 19.6%) reported having ever had chlamydia.

The follow-up rate was 47.3% (312/659) overall. There were no differences in demographic (mean age, sex) or baseline sexual history characteristics (number of sexual partners ever, condom use) between those who completed follow-up questionnaires and those who did not (data not shown). There was no difference in follow-up rate between the intervention (49.5%, 96/194) and control (46.5%, 216/465) groups; however, follow-up rate for the ‘engaged’ group (78.2%; 61/78) was significantly higher than for the ‘non-engaged’ group (30.7%; 35/114), p<0.0001, and for the control group (46.6%, 216/464), p<0.0001.

Table 2 presents the primary outcome measurement in the intervention and control groups (ITT) and in the engaged and control groups (PP analysis). Given the loss to follow-up at 6 months is a problem for ITT analysis, we also conducted a sensitivity analysis to examine the possible effects. A higher proportion of young people in the intervention group reported a chlamydia test compared with the control group (40.6% vs 31.0%) but this was not significant. However, the difference between the engaged intervention and control groups was significant (52.5% and 31.0%, respectively, p=0.002).

Of those who reported having had a chlamydia test at follow-up, a total of 14/99 (14.1%, 95% CI 7.95% to 22.6%) young people reported their tests were positive for chlamydia. Three were from the engaged group and 11 from the control group.

There was no change in knowledge between baseline and follow-up; however, baseline knowledge was high. The proportion of young people in total (n=312) who answered each of the seven questions correctly ranged from 77.6% to 95.8% at baseline.
The amount of clinician time required to respond to emails for participants who engaged in interaction was low (a few minutes per email). Responses usually provided information about what testing involved, confidentiality and services available. Some young people asked about other screening tests such as Pap smears, and some were interested in other STIs.

**DISCUSSION**

To our knowledge, this is the first RCT of an intervention to increase chlamydia testing implemented entirely in cyberspace. Young people who engaged in email interaction with a clinician were more likely to report having a chlamydia test after 6 months than young people who were not offered such contact. Knowledge, attitudes and condom use did not change.

Strengths of this study include originality, youth consultant advice and experimental rigour despite the uncontrollable study environment. Clinicians provided clear information about testing, treatment and relevant services rather than messages about ‘risk’ that could provoke fear. They answered young people’s questions regardless of topic, thus feeling listened-to might have generated confidence in seeking healthcare.

There were several limitations. Website reach was modest and target sample size was not achieved due to project constraints. This combined with loss to follow-up reduced the power of the study. The main outcome measure was based on self-report of testing that could not be verified. Overall follow-up rate was just under 50%; however, of those who engaged, 61/78 (78.2%) completed follow-up. Of the intervention group, baseline and 80.8 to 97.4% at follow-up. There was no difference between change in knowledge in the intervention and control groups or in the engaged and control groups. There were no attitude differences between the intervention and control or engaged and control groups at follow-up. The list of knowledge questions and attitude statements are shown in web appendix 4.
59.4% did not engage. Although there were no measurable differences in attitudes between these subgroups, it is possible that those who engaged were more concerned about chlamydia, more engaged with the health system or wanted to please the clinician or avoid embarrassment. Internet-based trials have high attrition rates, especially when there is no clinician contact at the outset.\textsuperscript{3} Attrition can occur either at uptake of an intervention or with failure to complete follow-up. This introduces dilemmas with analysing ITT populations in exactly the way we found. To improve validity, it has been suggested that individuals who do not take up an intervention be removed and that the remaining participants in the intervention group undergo a second randomisation process.\textsuperscript{15} Given our time frame, this was not feasible. Most internet-based RCTs have evaluated therapeutic interventions, such as pain management, chronic illness or mental health treatments.\textsuperscript{15–18} It is possible that participants who are asymptomatic are more likely to take up an intervention but also to dropout if no benefit is perceived. Our trial involved an intervention that was not therapeutic and targeted a behaviour change for an asymptomatic condition. We might therefore expect a higher dropout rate compared with therapeutic interventions but this was not the case. Nevertheless, we must be cautious about how to interpret our findings.

Other studies have used e-technology to increase chlamydia testing among young people. A RCT using SMS and email delivered sexual health messages to 994 young people who were recruited from a music festival. The study found that at 12 month follow-up, young women in the intervention group were significantly more likely to report Chlamydia testing than those in the control group. Follow-up rates were substantially lower than ours (34%).\textsuperscript{19}

Strategies combining the internet with home-based chlamydia testing have been evaluated. In Sweden, 62.3% of kits requested over the internet were returned for testing,\textsuperscript{20} in the USA 32.4% of women\textsuperscript{21} and 31% of men\textsuperscript{22} returned samples and in the Netherlands, 20% of the invites requested testing kits and 14% returned samples.\textsuperscript{23} Although our sample size was small, the fact that over 50% of young people who engaged in email interaction reported chlamydia testing at follow-up without the convenience of a home testing kit suggests that email interaction could help facilitate access to health services more broadly.

We found no significant changes in knowledge, attitudes or condom use. However, baseline knowledge was high and might have been positively impacted simply from navigating the website. That reported condom use was low and did not increase significantly highlights the complexities of this behaviour and relationship dynamics at the point of sexual encounter.\textsuperscript{24} Furthermore, heterosexual couples using other contraceptive methods are less likely to use condoms\textsuperscript{25} or pregnancy might be desired.

Cyberspace research presents methodological challenges. Participation rates are not measurable with unknown denominators, and external validity is difficult to ascertain.\textsuperscript{26} Website traffic data do not provide demographic information that would help determine eligibility or generalisability. Technology also changes rapidly. Members of our Youth Advisory Committee developed a MySpace page to promote our website and Facebook had not reached Australia. Between 2009 and 2011, Facebook overtook MySpace in number of unique visitors, and email has been overtaken or replaced by Facebook chatting, immediate messaging and texting.\textsuperscript{27}

Advantages include the potential to ‘scale up’ to achieve greater reach for minimal additional cost: our greatest cost was website development. Social networking may provide cheaper alternatives to paid advertising. The study clinicians could easily have managed a greater volume of emails at no additional cost. The internet has the potential to reach hard-to-reach populations, and the intervention itself could be transferable to other health issues. Potential ethical issues include email security, the misuse of online communication and ownership of personal information posted on the world wide web.\textsuperscript{28} While all data entered by participants in our study were secure and we were not aware of any ethical concerns, it is possible that concerns about privacy and security influenced young people’s decisions to participate in the study or to disclose personal information.

Our study has implications for further research. Cost—benefit analyses of a range of screening strategies would be useful for informing a broader screening programme. Qualitative research would help us understand more about why some young people engaged and others did not and their experiences of internet-based clinical interaction. A qualitative study with volunteers from our study has been undertaken.

Chlamydia is a common curable sexually transmitted infection that can have potentially serious consequences if undetected and untreated. E-technology has the potential to be a useful adjunct to a population-based screening programme.

Acknowledgements We would like to thank our Youth Advisors and all the young people who participated in the study.

Contributors MK prepared the first draft of the manuscript and completed revisions after discussion with the entire research team. MK, RS, AM, MW and TU participated in study design. MK wrote the content of the website. AR, RS, AM and MW reviewed website content. MK and MW recruited and facilitated the Youth Advisory Committee. AR and MK recruited study participants, delivered the intervention and collected all data. MK, AR, JP and TU completed data analysis. All authors assisted with interpretation of findings.

Funding This study was funded by the Australian Department of Health and Ageing as part of the Chlamydia Targeted Grants Programme.

Competing interests None.

Ethics approval Ethics approval was provided by the University of Sydney Human Research Ethics Committee.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES


Key messages

- Young people who engaged with clinicians online were more likely to access chlamydia testing than those who did not engage.
- Conducting studies in cyberspace is novel and presents challenges to the conventional frameworks for evaluating and interpreting scientific data.
- The internet can be a useful vehicle for sexual health promotion and an adjunct to screening strategies.


Win an 80G iPod!
Or one of 9 iPod shuffles
or 30 CD vouchers

Simply complete our questionnaire

What is it?
Chlamydia is the most common bacterial sexually transmitted infection in Australia and it’s on the rise among young people.
Find out more

Answers & Advice
Everything you need to know about Chlamydia, how it could affect you and what can be done about it.
Find out more

Take Action
Getting a test for Chlamydia is confidential, and if you have it you can be cured. It's that simple!
Find out more

Have your Say
Have you previously heard of Chlamydia?
- yes
- no
Submit

Visit our Get Clued Up myspace page
Add us as a friend, send us your comments today!
Web Appendix 2: Examples of emails and interaction between clinician and participant

Examples of questions asked by clinician to participant in Intervention group to prompt engagement:

“Do you know where you can get tested in your local area?”

“Are you aware you can get tested confidentially?”

Examples of responses from participants in Intervention group who engaged:

“No thanks I don’t have any questions about Chlamydia”

“I’m 22 and have been with my partner for 7 years on and off. I’ve had [various gynaecological issues]. I really want kids in the future… does it [chlamydia] stop you from having children? How long can you have this for before it starts to affect any chances of having children?

“Can any public hospital offer sexual health services etc or are the specialist sexual health centres better? And where is it around the inner city? [city disclosed]”

Personalised clinical advice given to engaged participants addressed chlamydia testing, condom use, and barriers such as embarrassment, cost and confidentiality and also other questions asked (eg about Pap smears and other STIs).

Example of non-personalised email sent to participant in Control group:

“Just another monthly reminder from us…Thanks again for taking part in our innovative study into Australian young people and their sexual health….You will still get 4 more monthly reminders from us before we ask you to do the 2\textsuperscript{nd} questionnaire, in [month, year].”
Web Appendix 3: Website traffic using Google Analytics

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of unique visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2007</td>
<td>2,030</td>
</tr>
<tr>
<td>July 2007</td>
<td>2,196</td>
</tr>
<tr>
<td>August 2007</td>
<td>3,374</td>
</tr>
<tr>
<td>September 2007</td>
<td>3,584</td>
</tr>
<tr>
<td>October 2007</td>
<td>3,422</td>
</tr>
<tr>
<td>November 2007</td>
<td>3,216</td>
</tr>
<tr>
<td>December 2007</td>
<td>2,380</td>
</tr>
<tr>
<td>January 2008</td>
<td>2,744</td>
</tr>
</tbody>
</table>
Web Appendix 4: Knowledge statements and attitude questions

Knowledge question

Chlamydia is a sexually transmissible infection that affects only women

Chlamydia can lead to sterility among women

A woman can have chlamydia without any obvious symptoms

A man can have chlamydia without any obvious symptoms

Chlamydia is curable

Chlamydia can be prevented by using condoms when you have sex

Chlamydia can be tested for with a urine sample

Attitude

I think I am at risk for chlamydia

I don’t think I have chlamydia

I don’t care whether I have chlamydia or not

I don’t know how to get a chlamydia test

I would be too embarrassed to see a doctor or nurse to talk about chlamydia

I would not see a doctor or nurse about chlamydia because I am worried about confidentiality

It is difficult for me to see a doctor or nurse about chlamydia because of transport

I would prefer to see a doctor or nurse who is the same sex as me for a chlamydia test

It is difficult for me to see a doctor or nurse about chlamydia because of cost

I would feel comfortable visiting a doctor or nurse to get a chlamydia test

I do not want to talk to a doctor or nurse about my sexual history

I can’t get a chlamydia test because I don’t have a Medicare card

I don’t want a chlamydia test because I’m scared of what it might show

I don’t want a chlamydia test because my partner/s might find out

I would have a chlamydia test if my partner/s wanted me to

I would have a chlamydia test if my doctor recommended it

I want to have a chlamydia test because I would want to prevent any long term health problems from Chlamydia

I want to have a chlamydia test because I don’t want to give chlamydia to my partner/s if I have it
Facilitating chlamydia testing among young people: a randomised controlled trial in cyberspace

SPANISH ABSTRACT

Cómo facilitar el tamizaje de clamidia entre la gente joven: un ensayo aleatorio controlado en el ciberespacio

RESUMEN

Objetivos: La notificaciones de casos de clamidia han ido en aumento en Australia por más de una década y son mayores en la gente joven. Este estudio fue dirigido a evaluar el impacto de una intervención con base en la internet sobre el tamizaje de clamidia entre gente joven de 10 a 25 años de edad.

Métodos: En este ensayo aleatorio controlado, el reclutamiento, la recolección de datos, las intervenciones del estudio y el seguimiento correspondiente ocurrieron en el ciberespacio, a través de un sitio web. Los participantes elegibles tenían entre 16-25 años de edad y residían en Australia. El grupo de intervención recibió correos electrónicos personalizados alentándolos a la interacción con respecto a hacerse la prueba de clamidia, mientras que el grupo control recibió correos electrónicos impersonales. El resultado primario fue el autoreporte de haberse hecho la prueba de clamidia dentro de los siguientes seis meses; los resultados secundarios fueron el uso del condón y los cambios en conocimiento y actitudes.

Resultados: 704 jóvenes completaron la información de base, 40 fueron excluidos y 5 se retiraron antes de iniciar el seguimiento. La tasa de seguimiento global fue de 47.3%. dentro del grupo de intervención, 40.6% (95% CI 30.7% a 51.1%) reportaron haberse hecho una prueba de clamidia durante el seguimiento en comparación con el 31.0% (95% CI 24.8% a 37.2%) en el grupo control (p=0.07). Un análisis por protocolo descubrió que aquellos que fueron comprometidos a la interacción por correo electrónico estuvieron más dispuestos a reportar la toma de la prueba de clamidia que aquellos en el grupo control (52.5%, 95% CI 39.3% a 65.4% cf 30.0%, 95% CI 24.8% a 37.2%, p=0.002). No hubo diferencias en resultados secundarios entre los dos grupos.

Conclusiones: Este es el primer ensayo aleatorio controlado que se hace en el ciberespacio para promover el tamizaje de clamidia. Las tecnologías de información y comunicación podrían resultar útiles para promover el tamizaje de clamidia y las conductas de cuidado de la salud en la gente joven.

A Spanish version of the full text of this article is available to members of IUSTI Latin America/ALACITS via the members’ area of the ALACITS website at www.alacits.org.