Interventions to Increase Rescreening for Repeat Chlamydial Infection

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Background: Repeat infection with *Chlamydia trachomatis* following treatment is common and increases the risk of sequelae. Despite clinical guidelines recommending rescreening within 3 months of treatment, rescreening rates remain low. We undertook a systematic review to identify studies that compared rates of rescreening for repeat chlamydial infection between patients receiving and not receiving an intervention.

Methods: We searched Medline, EMBASE, and conference Web sites from 2000 to September 2010 using variations of the terms "chlamydia" and "rescreening" and "intervention." We used meta-analysis to calculate the overall relative risk (RR) effect on rescreening rates by study design and strategy type.

Results: We identified 8 randomized controlled trials (RCTs) and 4 controlled observational studies, all conducted in the United States. Four RCTs assessed mailed screening kits ± reminders, with an average effect estimate of 1.30 (95% confidence interval [CI]: 1.01–1.50); 2 RCTs assessed motivational interviewing ± reminders with a summary effect of 2.15 (95% CI: 0.92–3.37); one RCT evaluated the effect of reminders with a RR of 9.67 (95% CI: 1.31–71.31), and another RCT assessed the effect of a $20 patient incentive with a RR of 1.16 (95% CI: 0.62–2.17). Three controlled observational studies assessed reminder strategies with RRs of 1.97 (95% CI: 1.76–2.21), 1.01 (95% CI: 0.66–1.55), and 1.88 (95% CI: 1.58–2.24)—a summary effect was not calculated due to significant heterogeneity; and one controlled observational study assessed the promotion of clinical guidelines with a RR of 1.35 (95% CI: 0.96–1.90).

Conclusion: The review suggests that the use of mailed screening kits is an important strategy to increase rescreening, reminder systems are promising, and motivational interviewing is worth investigation.

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Chlamydia trachomatis is the most common reportable infection in the United States (US), Australia, and other European countries.[1–3] In 2010, around 1.3 million new diagnoses were reported in the US.[1] Chlamydial infection is associated with adverse health outcomes including pelvic inflammatory disease, ectopic pregnancy, and tubal infertility.[4,5] Repeat infections are associated with an increased risk of reproductive health complications.[5] As chlamydia is most commonly asymptomatic, screening is required for detection of infections.

Repeat chlamydial infections are common. The repeat infection rate following treatment in women in US cohorts was 15.5% at 6 months[6] and 22% at 12 months in an Australian study.[7] In men, the repeat infection rate was 10.9% at 4 months.[8] People treated successfully for chlamydia are at risk of reinfections due to sex with new partners or sex with previous partners who have not yet been treated.[9] Batteiger et al found that of the repeat infections identified among young women participating in a longitudinal cohort; 84.2% had evidence of reinfection, based on the presence of different genotypes.[10] Although reinfection rates can be reduced by improved partner treatment, rates of chlamydia reinfection are still high (>10%) among women whose partners received treatment, thus highlighting the importance of rescreening.[11,12]

Rescreening at 3 months is also important to detect treatment failures. There is increasing evidence that use of azithromycin for treatment of chlamydia is associated with higher than expected treatment failure rates. Batteiger et al found 13.7% of repeat infections appeared to be treatment failures based on genotyping and sexual behavior data,[10] and a randomized controlled trial (RCT) by Schwebke et al found a cure rate of only 77.4% (41 of 53 patients) when azithromycin was used to treat chlamydial nongonococcal urethritis.[13]

Since 2002, clinical guidelines in the US, Australia, and many European countries have recommended that any person diagnosed with chlamydia should be retested within 3 months of treatment.[14–17] Despite this recommendation, rescreening for repeat chlamydial infection rates remains low in many clinical settings.[18–20] Over the past five years, a number of initiatives to increase rescreening for repeat chlamydial infection have been undertaken and evaluated. In this article, we systematically review the evidence for the impact of those interventions.

METHODS

This systematic review was conducted according to the PRISMA statement.[21]

Definitions

Rescreening was defined as a test occurring 3 weeks to 12 months subsequent to an index episode of chlamydial infection. Repeat infection was defined as a positive chlamydia

test after the index chlamydial infection, regardless whether the infection was due to new exposure following treatment, treatment failure, or lack of initial treatment.

Review Strategy

The electronic bibliographic databases, Medline, EMBASE, the Cochrane Controlled Trials Register, and the Australian New Zealand Clinical Trial Registry, were searched to the end of September 2010. Only English language papers were included. Reference lists of selected studies were also checked for other potentially relevant studies. Web sites and conference proceedings of the following conferences were also reviewed to identify potential unpublished studies: the National STD Prevention Conference, Centers for Disease Control and Prevention, US; The International Society for Sexually Transmitted Diseases Research Meetings; the Australasian Sexual Health Conference; and the British Association of Sexual Health and HIV Meetings. Conference presentations were included if the corresponding full report was not available. If the required information was not available in the report or conference presentation, authors were contacted for unpublished data. Studies published from 2000 onwards only were included.

The following terms were used in the searches:

1. "Rescreening" or "repeat screening" or "retesting" or "repeat testing" or "reinfection" or "repeat infection" or "test for reinfection" or "test of reinfection" or "recurrent" or "persistent" or "test of cure" or "treatment failure," AND
2. "Chlamydia infections" or "chlamydia" or "*Chlamydia trachomatis*" AND
3. "Intervention" or "trial" or "intervention studies"

The studies were reviewed and information was extracted by two authors independently. Disagreements were resolved by discussion and consensus. A study was considered for inclusion in the review if it described the rate of rescreening for repeat chlamydial infection following an intervention aimed at increasing rescreening rates and compared it with rescreening rates in a control group which did not receive the intervention, or a comparison period in the same population. Studies were excluded if they did not include a comparison group or comparison period; reported on rescreening rates or repeat infection in the absence of a specific intervention; described surveys of patients or providers about rescreening for repeat chlamydial infection but did not measure rescreening rates; or if original data were not reported.

For each study that met inclusion criteria, information was extracted on the clinic location, the target population, the intervention strategy, the study design, the sample size, the statistical tests used, the outcomes of the evaluation including rescreening for repeat chlamydial infection rates and repeat infection rates. From each report, we either abstracted or calculated the relative risk (RR) comparing rescreening rates in the intervention and control groups, as the primary effect measure for the study. One study presented rescreening rates for 2 time periods ($\leq$3 months and 11–15 weeks), and in this instance, we used the $\leq$3-month time interval in the rescreening analysis.

To examine evidence for publication and small study biases, we drew funnel plots of log risk ratios against trial size (measured by standard error of the log risk ratio). Where appropriate, we pooled data using meta-analysis. We used the I^2 test to estimate the approximate proportion of total variability in point estimates that can be attributed to heterogeneity other than that due to chance.[22] We used the following strategy to pool data, depending on the level of between trial heterogeneity:

- I^2 <25%, fixed effects meta-analysis to estimate the common RR (95% confidence interval [CI]), assuming that all or most between-trial variability is due to chance;
- I^2 25% to 75%, random effects meta-analysis[23] to estimate the average RR. We present both 95% CI, which express uncertainty around the average effect, which is assumed to be normally distributed, and the 95% prediction interval (PI), which takes into account the whole distribution of the effects;[24]
- I^2 >75%, heterogeneity too great for summary estimate to be calculated.

We explored possible reasons for heterogeneity by stratifying study results by study design (randomized vs. nonrandomized studies), and type of intervention. Meta-analysis was performed in STATA 10 (StataCorp, College Station, TX).

RESULTS

There were 243 studies identified in the search and the abstracts were reviewed (Fig. 1). Of these, 235 studies were excluded because they either described a study of diseases (including sexually transmitted infections) other than genital chlamydia (n = 170); described interventions to improve outcomes other than rescreening for repeat chlamydial infection (n = 53); described a cross sectional or cohort study which reported rescreening for repeat chlamydial infection or repeat infection rate (n = 5); described a cost-effectiveness analyses of the impact of rescreening for repeat chlamydial infection but no new empirical data comparing rescreening in intervention and control populations (n = 1); there was no control group (n = 3); were reviews or commentaries which did not contain original data (n = 2); or described surveys of patients or providers about rescreening for repeat chlamydial infection but did not refer to an intervention (n = 1) (Fig. 1).

The remaining 8 studies were included in the review;[25–32] all were conducted in the US, with 4 evaluated with a RCT design and 4 others with a controlled observational design (Table 1). Of the 8 studies; 4 were conference presentations and 4 were published in peer-reviewed journals. The 8 studies evaluated 12 separate interventions aimed at increasing rescreening rates. One study evaluated 4 distinct strategies[25] and another evaluated the intervention in 2 different clinical settings.[31]

Eight of the 12 interventions were based in sexually transmitted disease (STD) clinics,[25–28,31] 2 in family planning clinics (FPCs),[30,31] and 2 in a variety of primary care clinics (including Infertility Prevention Project Clinics).[29–32] The follow-up period for assessing whether rescreening had occurred varied across interventions (Table 1). The sample size in the RCTs ranged from 102 to 808, and in the controlled observational studies ranged from 173 to 10,432.

The approaches taken to increase rescreening for repeat chlamydial infection could be grouped into 5 broad categories: single or combinations of reminders (phone, e-mail, letter, and postcard)[25–27,29]; mailed screening kits with or without reminders[28,31,32]; patient incentives[25]; motivational interviewing for patients with or without reminders[25]; and promotion of rescreening guidelines to clinicians[30] (Table 1).

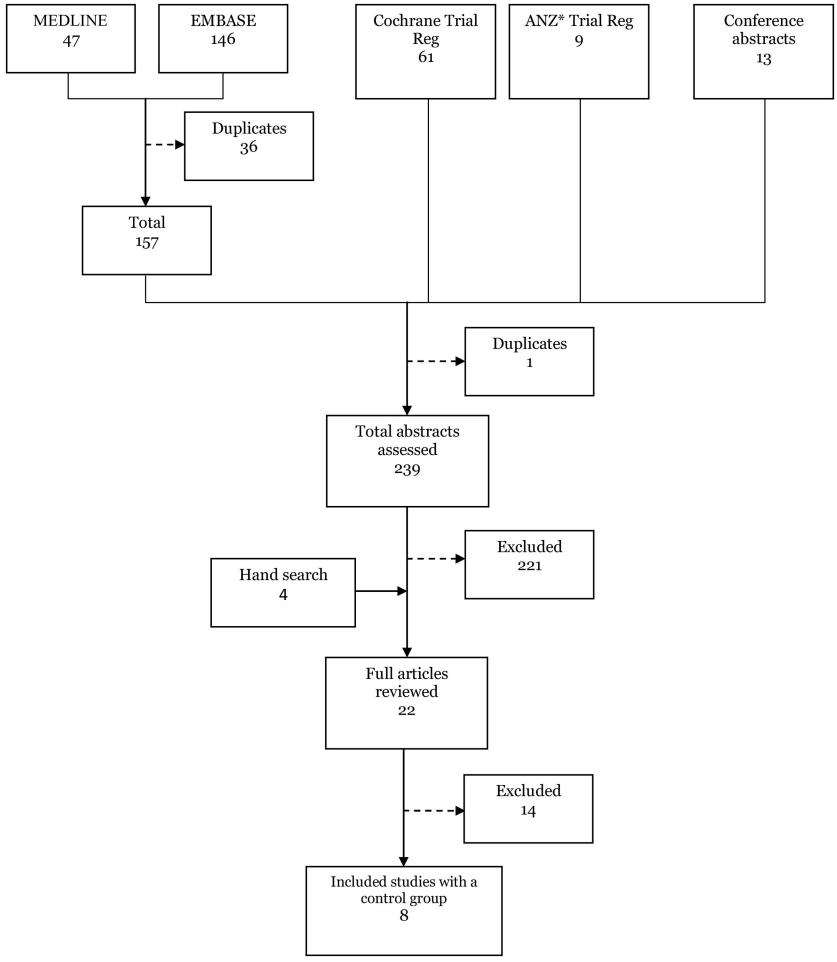

Figure 1. Search results. *ANZ = Australian New Zealand.

Rescreening Rates in Individual Studies

As shown in Table 1, the highest rescreening achieved by an intervention was 48%. Among those interventions which presented rescreening rates for both males and females, the rescreening rates in males were generally lower than females in the control group; and in some studies and settings, the intervention increased rescreening preferentially in females; and in others, it increased more markedly in males (Table 2).[25,27,29] In the study by Malotte et al,[25] at both study sites, the rescreening rate in females was lower in the intervention group compared with the control group.

Meta-Analysis

We calculated a crude RR for each paper. The use of any strategy to increase rescreening was associated with an I^2 of 77% ($P < 0.01$) demonstrating significant heterogeneity, thus we didn't calculate a summary effect estimate. Stratification by study design show that the heterogeneity was largely due to the observational studies. The use of any strategy to increase rescreening among observational studies was associated with an I^2 of 83% ($P < 0.01$) and the use of any strategy evaluated by an RCT to increase rescreening was associated with an I^2 of 1.5% ($P = 0.418$). On this basis, the meta-analysis was stratified by study design—RCT versus observational design.

The funnel plot for RCTs (Fig. 2) showed 2 studies to the bottom right quadrant with inflated effects possibly due to poor methodological quality. These 2 studies were both small sample size studies from the same trial by Malotte et al and only evaluated to disentangle significant effect observed in the initial study that had a much larger sample size.[25]

Figure 3 shows the effect of RCT interventions on rescreening by strategy type. There were 4 RCTs assessing mailed screening kits with or without reminders, with an I^2 of 36.9% ($P = 0.19$). The random effects model showed the average effect was 1.30 (95% CI: 1.10–1.50) and the 95% PI was 0.62 to 1.98. There were 2 RCTs assessing motivational interviewing with or without reminders with an I^2 of 0.0% ($P = 0.87$), thus a fixed effects model was used giving a summary effect of 2.15 (95% CI: 0.92–3.37). Only one RCT assessed the effect of reminders with a RR of 9.67 (95% CI: 1.31–71.31), another RCT assessed the effect of patient incentives with a RR of 1.16 (95% CI: 0.62–2.17).

Figure 3 shows the effect of interventions on rescreening by strategy type evaluated using an observational studies design. Three interventions assessed reminder strategies with RRs of 1.97 (95% CI: 1.76–2.21), 1.01 (95% CI: 0.66–1.55), and 1.88 (95% CI: 1.58–2.24)—a summary effect was not calculated due to significant heterogeneity (I^2 of 86%, $P < 0.01$). One other intervention assessed the effect of promotion of clinical guidelines with a RR of 1.35 (95% CI: 0.96–1.90).

TABLE 1. Interventions Aimed at Improving Chlamydial Rescreening, Overall Finding (N = 12)

Author, Year	Intervention Type	Intervention Strategy	Design	Sex	Target Age Groups (yr)	Clinics (n), Type	Retest Outcome Time Period	Intervention Phase	Intervention Group Patients (n)	Intervention Group Retested (%)	Control Group Patients (n)	Control Group Retested (%)	OR 95% CI, *P* (as Reported in Paper)	Crude Relative Risk (95% CI) Calculated by Reviewers
Gindi et al, 2004[30]	Promotion of guidelines	Promotion of guidelines	Before-After	F	NR	13 FPCs	3–4 mo	During	916	5.4	—	—	NR	1.35 (0.96–1.90)
								Before	2120	4.0	—		—	
							1–6 mo	During	861	22.8	—	—	NR	1.15 (0.94–1.41)
								Before	622	19.8	—	—		
Malotte et al, 2004[25] Study 2	Motivational interviewing ± reminder	Motivational interviewing	RCT	F, M	14–30	1 STD	≤3 mo	During	25	12.0	29	3.4	OR = 2.5 (95% CI: 0.2–28.0)*	3.48 (0.39–31.38)
Malotte et al, 2004 [25] Study 1		Motivational interviewing plus telephone or letter reminder	RCT	F, M	14–30	2 STD clinic	≤3 mo	During	136	23.9	141	11.4	OR = 2.5 (95% CI: 1.3–4.8)*	2.14 (1.24–3.70)
Malotte et al, 2004[25] Study 1	Incentive	$20 patient incentive	RCT	F, M	14–30	2 STD clinic	≤3 mo	During	144	13.2	141	11.4	OR = 1.19 (95% CI: 0.6–2.4)*	1.16 (0.62–2.17)
Gudgel et al, 2006[29]	Reminder	Phone, letter or email reminder in 2/3 clinics	Before-After	F, M	NR	55 PCCs	2.5–6 mo	During	5863	16.0			NR†	1.97 (1.76–2.21)
								Before	4569	8.1				
Kohn et al, 2010[26]		Phone reminder plus letter reminder for nonattenders	Before-After	F	NR	1 STD clinic	1–5 mo	During	65	36.9			NS‡	1.01 (0.66–1.55)
								Before	88	36.4				
Malotte et al, 2004[25] Study 2		Phone reminder	RCT	F, M	14–30	1 STD clinic	≤3 mo	During	27	33.3	29	3.4	OR = 12.3 (95% CI: 1.4–112.0)*	9.67 (1.31–71.31)
Paneth-Pollak et al, 2010[27]		Postcard reminder	Controlled observational	F, M	NR	10 STD clinics	2.5–4 mo	During	1267	14.1	3861	7.5	$P < 0.01$‡	1.88 (1.58–2.24)
								Before	—	—	1092	8.6	$P < 0.01$‡	—
Cook et al, 2007[32]	Mailed screening kit	Mailed screening kit	RCT	F	15–24	11 PCCs	Average tests per person per yr	During	§99	2.38	§99	2.02	Rate ratio = 1.18 (95% CI: 1.03–1.35)¶	1.18 (1.03–1.35)

(*Continues*)

TABLE 1. (Continued)

Author, Year	Intervention Type	Intervention Strategy	Design	Sex	Target Age Groups (yr)	Clinics (n), Type	Retest Outcome Time Period	Intervention Phase	Intervention Group Patients (n)	Intervention Group Retested (%)	Control Group Patients (n)	Control Group Retested (%)	OR 95% CI, *P* (as Reported in Paper)	Crude Relative Risk (95% CI) Calculated by Reviewers
Sparks et al, 2004[28]		Option of mailed screening kit or clinic rescreening	RCT	F, M	>14	1 STD clinic	28 d	During	60	45	62	32	OR = 1.7 (95% CI: 0.8–3.8)[‖]	1.39 (0.88–2.20)
Xu et al, 2008[31]		Mailed screening kit plus subset received telephone reminder before scheduled rescreening (STD clinics)	RCT	F	>15	3 STD clinics	≤3 mo	During	407	31.9	401	25.4	*P* = 0.04[‖]	1.26 (1.01–1.56)
							11–15 wk	During	407	21.3	401	15.5	*P* = 0.04[‖]	1.38 (1.02–1.86)
		Mailed screening kit plus subset received telephone reminder before scheduled rescreening (FPCs)	RCT	F	>15	FPCs	≤3 mo	During	[§]202	48.0	[§]202	28.0	*P* < 0.01[‖]	1.70 (1.31–2.21)
							11–15 wk	During	[§]202	27	[§]202	20	*P* = 0.10[‖]	1.38 (0.96–1.97)

Multiple logistic regression analysis controlled for age, sex, race/ethnicity, education, employment status, and study location.
*Intention-to-treat analysis.
[†]χ^2 test conducted on females rates only ($P < 0.0001$).
[‡]The statistical test used was not reported.
[§]Total sample size given in RCT, but not sample size in each arm, thus the total was divided by 2.
[¶]Intention-to-treat analysis.
[‖]χ^2 test or *t* test for equality of proportions.
SHC indicates sexually transmitted disease clinic; FPC, family planning clinic; IFC, infertility clinic; PCC, primary care clinic; RCT, randomized controlled trial; M, male; F, female; NR, not reported; NS, not significant.

TABLE 2. Interventions Aimed at Improving Rescreening for Repeat Chlamydial Infection, by Sex (N = 4)

Author, Year	Intervention (Comparison Strategy)	Retest Time Period	Clinic	Target Group	Intervention Phase	Intervention Group		Control Group		*P* Reported in Paper
						Patients (n)	Retested (%)	Patients (n)	Retested (%)	
Malotte et al, 2004[25] Study 1	$20 incentive	≤3 mo	Clinic 1	F	During	—	6.9	—	13.8	NR
				M	During	—	23.3	—	17.7	NR
			Clinic 2	F	During	—	9.1	—	17.6	NR
				M	During	—	13.5	—	7.7	NR
Malotte et al, 2004[25] Study 1	Motivational interviewing plus telephone or letter reminder		Clinic 1	F	During	—	28.6	—	13.8	NR
				M	During	—	17.9	—	17.7	NR
			Clinic 2	F	During	—	29.0	—	17.6	NR
				M	During	—	22.4	—	7.7	NR
Paneth-Pollak et al, 2010[27]	Postcard reminder	2.5–4 mo	All	F	During	480	17.5	1203	10.0	Women more likely to be retested than men in all groups:
					Before	—	—	396	11.1	Intervention ($P < 0.01$)
				M	During	787	12.1	2658	6.3	Before (0.03)
					Before	—	—	696	7.2	Nonintervention ($P < 0.01$)
Gudgel et al, 2006[29]	Phone, letter or e-mail reminder	2.5–6 mo	All	F	During	4500	19.0	—	—	$P < 0.01$
					Before	3268	9.0	—	—	
				M	During	1363	6.0	—	—	NR
					Before	1301	6.0	—	—	

M indicates male; F, female; NR, not reported.

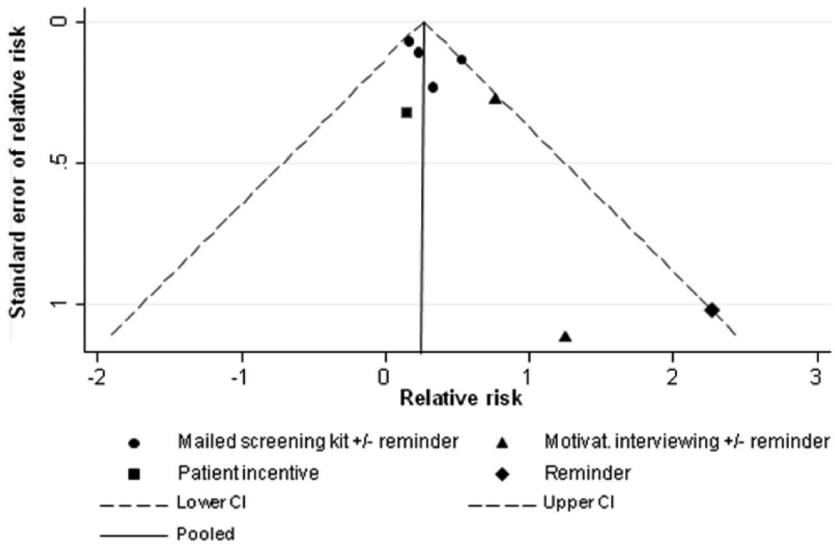

Figure 2. Funnel plot for studies on effect of interventions on rescreening, RCTs only (n = 8).

Repeat Infection Rates

Of the 5 interventions[26,27,31,32] which reported repeat infections rates, 4 showed the repeat infection rate was lower in the intervention arm compared with the control arm (12.3% vs. 20.1%, 20.4% vs. 24.1%, 12.5% vs. 18.8% and 14.6% vs. 17.2%); and in another intervention which achieved the highest retesting rates, the repeat infection rate was slightly higher in the intervention arms compared with the control arm (14.0% vs. 12.0%) (Table 3).

DISCUSSION

We identified 8 studies and found that a variety of strategies can increase rescreening for repeat chlamydial infection in primary care. We found that mailed screening kits, reminders, and combinations of both approaches were the most effective at increasing rescreening.

Three studies were evaluated using a before-after design, and it is possible that the intervention group patients may have had characteristics that facilitated rescreening irrespective of receiving the intervention. Some studies may also have underestimated rescreening rates, as a proportion of patients may have undergone screening at other health services. Most studies were conducted in STD clinics, raising the question of generalizability to other healthcare settings. It is possible that the primary care setting includes a group of patients who differ in terms of rescreening and reattendance characteristics from those attending sexual health clinics. For example in the study by Xu et al,[31] considerably higher rescreening rates were achieved in FPCs in the US compared with STD clinics.

One of the reminder strategies identified in the review was evaluated using an RCT and showed a significant increase in rescreening; the other 3 were observational studies and could not be pooled due to substantial heterogeneity between studies, but 2 showed a significant increase in rescreening. Of the 4 reminder strategies, 3 involved phone calls (± letters and emails), and 2 of these 3 studies showed significant increased in rescreening. Phone reminder calls have been found to be useful in other contexts. A meta-analysis of 23 randomized trials found that phone reminders were effective in reducing missed appointments,[33] and a Cochrane review showed that postcards, letters, and telephone calls were all effective in improving vaccination rates in patients, with phone reminders being most effective but most expensive.[34] Phone reminders have been shown to be cost-effective in increasing rescreening,[35] but phone reminder systems are resource-intensive because of the need for multiple attempts, often outside typical business hours. As demonstrated by Xu et al, the reach can be low, with only 50% of women successfully reached by the phone call in this trial; however, among those reached the rescreening rates increased to 55.4% in the intervention group, compared with 31.9% in the control group with a subset only receiving the reminder.[31]

One study in our review assessed the impact of postcard reminders on increasing rescreening, and found it to be a successful strategy to increase rescreening for repeat chlamydial infection. This finding is consistent with research in other areas of health. For example, low-cost self-addressed postcards have been successfully used to improve clinic attendance in dental care[36] and pediatrics.[37,38] However, in our review, the effect observed for postcard reminders was smaller than seen for phone reminders.

Three reminder strategies that did not appear in our review was the use of text messaging, electronic medical record alerts, and automated phone calling systems. Text messaging has been found to have similar efficacy to letters and phone calls at encouraging behavior change, but is much cheaper.[39] Text message reminders also have the advantage of convenience and immediacy. Acceptability of test message reminders has been specifically demonstrated in the sexual health context.[40] Medical alerts which prompt clinicians to consider an outstanding medical procedure/test or vaccination when a patients attends for their next consultation are used in primary care for various purposes such as immunization catch ups and could be particularly effective for rescreening reminders among clinicians in settings such as general practice where many patients attend the clinic for reasons unrelated to chlamydia on at least an annual basis.[41] Third, automated phone calling systems are now used by many private offices in the US to remind patients of their appointment and could decrease the cost of calling as a reminder.

An internet-based survey of clinicians at FPCs in California found only 44% of clinicians reported using active

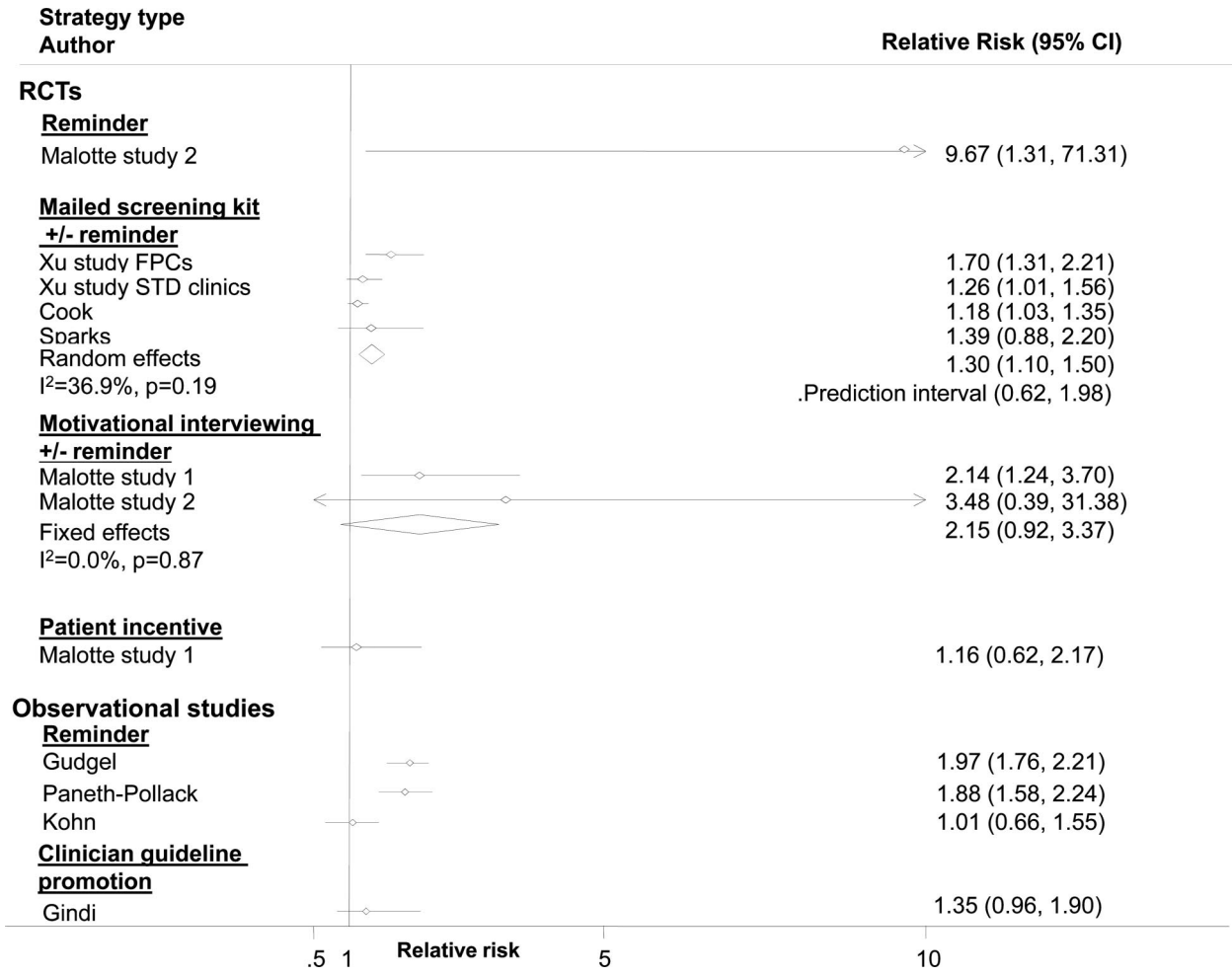

Figure 3. Effect of interventions on rescreening by strategy type, RCTs only (n = 8). The diamond represents the combined RR and 95% confidence interval. STD indicates sexually transmitted diseases; FPC, family planning clinics. Effect of interventions on rescreening by strategy type, controlled observational studies only (n = 4). *The 3 reminder strategies gave an I-squared of 86% ($P = 0.001$) demonstrating that heterogeneity was too great for a pooled estimate to be calculated.

reminder strategies for rescreening, 50% used low-intensity strategies (written materials, wall posters, verbal motivational interviewing, or unknown strategy), and 6% used no strategies. Of the active reminder strategies, 33% made follow-up appointments or gave appointment cards to patients; 29% used phone calls, 17% used letter reminders, 17% used chart-based reminders, 1% used e-mail reminders, and no provider used text messaging as a strategy.[42] The most common barrier to rescreening was patients not returning to be retested.[42]

The studies of mailed screening kits for self-collection of samples resulted in a significant increase in rescreening rates and with the meta-analysis random effects model showing an average effect of 1.30 (95% CI: 1.10–1.50) and I^2 of 36.9% ($P = 0.19$) suggesting 37% of the variability in effect estimates is due to real study differences (heterogeneity) and 63% due to chance. The PI of 0.62 to 1.98 contained one meaning that mailed screening kits with or without reminders may not increase rescreening when applied in some individual study settings. However, in some of the mailed screening kit interventions,[31,32] a reminder system was used in both the intervention and control group, potentially reducing the apparent benefit of the mailed screening kit. The mailed screening kit strategy reported by Xu et al[31] was found to have a cost benefit compared to returning to the clinic for rescreening; $54 per self-collected test compared to $118 if the specimen was taken in clinic.[43] Self-collected samples have been used in a variety of clinical and nonclinical settings to expand access to chlamydia screening in young women.[44,45] Self-collected urine or vaginal swabs for *C. trachomatis* can be tested with nucleic acid amplification tests, and thus should not result in any loss of accuracy compared to clinic-derived specimens.[46] Self-collected urine and vaginal specimens are both acceptable in men and women.[47]

Motivational interviewing remains a potential strategy to be used to increase rescreening; however, further empirical evidence is needed. Both studies included in the review were from the same trial by Malotte et al, and motivational interviewing alone was only evaluated to disentangle the significant effect observed for motivational interviewing combined with a reminder, and thus was based on a small sample size.[25] Motivational interviewing have been demonstrated to be effective at encouraging other health behavior change such as smoking

TABLE 3. Repeat Infection Rate in Interventions Aimed at Improving Rescreening for Repeat Chlamydial Infection (N = 4)

Author, Year	Intervention (Comparison Strategy)	Target Group	Retest Outcome Time Period	Intervention Phase	Intervention Group		Control Group		OR 95% CI, *P* as Reported in Paper
					Retests (n)	Repeat Infection (%)	Retests (n)	Repeat Infection (%)	
Cook et al, 2007[32]	Mailed screening kit	Females 15–24 yr	18 mo	During	2.38*	20.4†	2.02*	24.1	NS
Kohn et al, 2010[26]	Phone reminder plus letter reminder for nonattenders	Females	1–5 mo	During	24	12.5	32	18.8	NS
Paneth-Pollak et al, 2010[27]	Postcard reminder	Males and females	2.5–4 mo	During	179	12.3	288	20.1	$P = 0.05$
				Before	—	—	94	25.5	$P = 0.02$
Xu et al, 2008[31]	Mailed screening kit plus subset received telephone reminder before scheduled rescreening (SHCs)	Females >15 yr	11–15 wk*	During	82	14.6	58	17.2	$P = 0.68$
	Mailed screening kit plus subset received telephone reminder before scheduled rescreening (FPCs)	Females >15 yr	11–15 wk*	During	97	14.0	56	12.0	$P = 0.80$

*Average CT/NG tests per person per year.
†Per 100 women years.
‡Repeat infection rates not available for rescreening ≤3 mo.
NS indicates not significant.

cessation, but the effect is generally modest, and the strategy is resource intensive.[48,49]

The lack of effect seen for the patient incentives in the review study may be the result of the long time period between the initial visit and the rescreening visit. Malotte et al[25] suggested a combination of incentives, and a reminder may have been more effective than either strategy alone by making the availability of the incentives more apparent to the participants closer to time of the rescreening visit.

A number of interventions identified in the review, demonstrated that patients may choose different strategies depending on their personal circumstances, and it is important for programs to provide different options. In the intervention group of the study by Sparks et al, 30% of participants selected the self-collected mailed screening kit strategy, and 70% chose to attend the clinic for rescreening.[28] The study by Cook et al, reported that although most women (179) received their home kit in the mail, 18 (9%) picked it up from the clinic.[32] A recent analysis of young women recruited from a music festival in Australia, who were mailed a screening kit, showed those living with their parents were less likely to post back the screening kit suggesting there may have been issues of confidentiality.[50] These findings suggest that interventions need to be tailored to patient needs and preferences, with emphasis on meeting diverse needs of males and females, adolescents and adults.

Our review also showed that 4 of the 5 interventions that reported repeat infections rates, the rate was lower in the intervention arm compared with the control arm (only 1 study showed this difference was statistically different). As the studies in this review did not collect treatment data or detailed sexual behavior data, we were unable to distinguish between reinfection, new infections, and treatment failures. If we accept that most are reinfections based on the study by Batteiger et al,[10] this suggests that the interventions to encourage rescreening are reaching patients at lower risk of chlamydial reinfection. For example in the RCT by Xu et al,[31] although a similar number patients were enrolled in each arms of the study (around 400) and the rescreening rate increased to 31.9% in the intervention arms compared with the 25.4% in the control arm, there was a similar yield of positive tests at retest (12 in the intervention arms vs. 10 in the control arm). Similarly, in the postcard reminder intervention study described by Paneth-Pollak et al,[27] the proportion of persons returning for rescreening increased in the postcard group, but there was no change in the number of infections detected at rescreening. However, strategies that are able to increase rescreening rates to 50% or above may find the numbers of infections detected are much greater. This raises the issue of whether trials are needed to assess whether rescreening can lead to a reduction in the complications associated with chlamydia such as pelvic inflammatory disease.

This review has some methodological limitations. Although we searched multiple electronic bibliographic database and conference Web sites, it is still possible that some evaluations were not identified, particular those with a negative outcomes. Also, due to the heterogeneity of the observational studies, we were unable to pool all studies to determine a summary effect, and in the RCTs and observational studies, some intervention strategies also could not be pooled due to heterogeneity.

Based on our review of the literature, although chlamydia reinfection is an important health issue for women, we only identified 8 published studies, representing 12 interventions, to ensure rescreening 3 months after treatment. The review suggests that the use of mailed screening kits is an important strategy to increase rescreening, and phone reminder systems are promising. Text message may be useful as a reminder strategy but has not yet been formally evaluated in this context, and motivational interviewing requires further investigation. We recommend that clinic rescreening protocols incorporate one or more evidence-based approaches to enhance rescreening effectiveness.

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