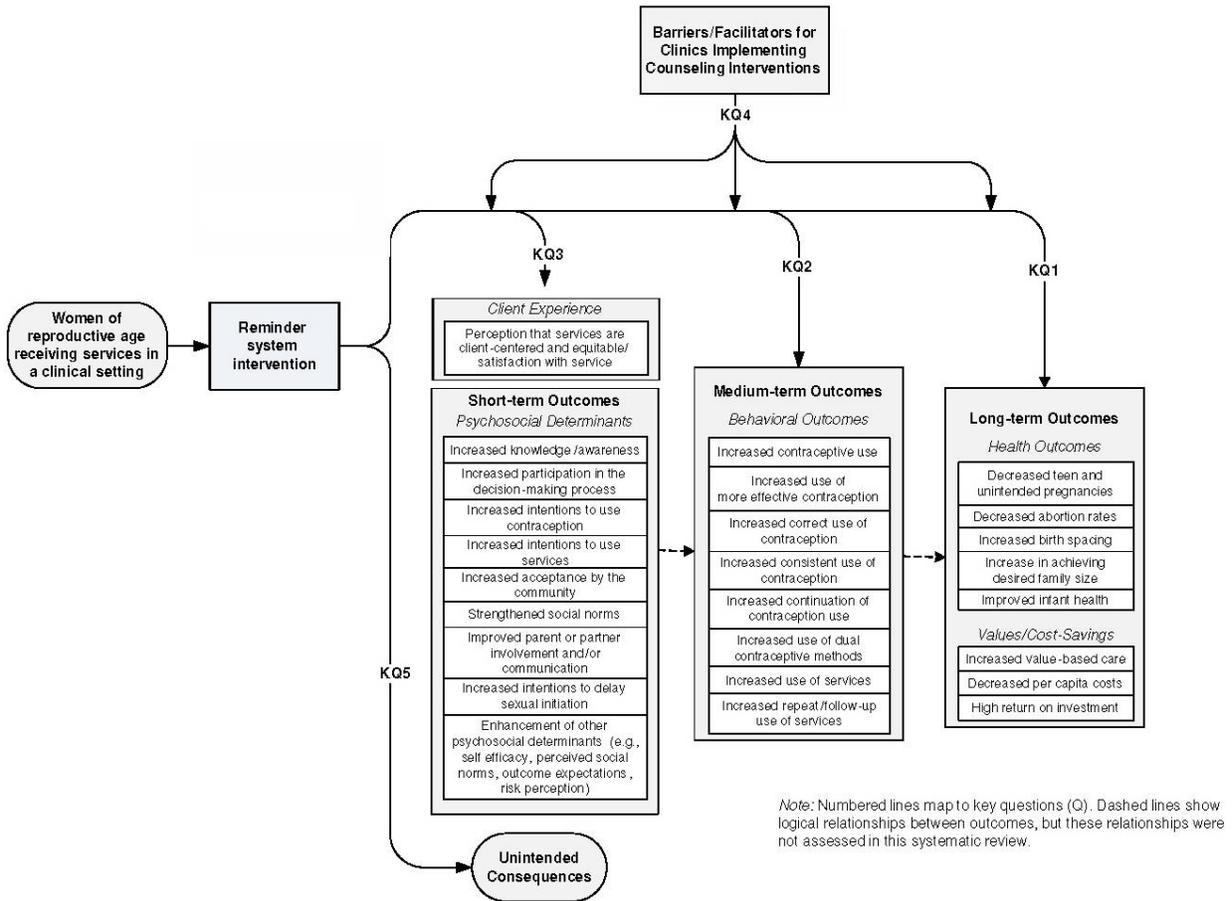


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**Appendix Figure 1.** Analytic framework for updated systematic review on the impact of reminder systems in clinical settings to improve family planning outcomes.



**Appendix Table 1.** Search Terms and Strategy Used in the Updated Systematic Review

Set #	Concept	PubMed search terms <sup>a</sup>
1	Family planning	“family planning”[All fields] OR “family planning services”[MeSH] <sup>b</sup> OR “family planning services”[All fields] OR “family planning policy”[MeSH] OR “family planning policy”[All fields] OR “reproductive health services”[MeSH] OR “reproductive health services”[All fields] OR “Title X”[All fields] OR “Planned Parenthood”[All fields]
2	Contraception	contraception[MeSH] OR contracept*[All fields] OR “contraceptive agents”[MeSH] OR “contraceptive agents”[All fields] OR “contraceptive devices”[MeSH] OR “contraceptive devices”[All fields] OR “birth control”[All fields] OR “contraception behavior”[MeSH] OR “contraception behavior”[All fields]
3	Counseling	counseling[MeSH] OR counseling[All fields] OR “patient-centered”[All fields] OR “patient comprehension”[All fields] OR “patient understanding”[All fields] OR “patient participation”[MeSH] OR “patient participation”[All fields] OR “patient autonomy”[All fields] OR “decision making”[MeSH] OR “decision making”[All fields] OR “active decision”[All fields] OR “informed decision”[All fields] OR “informed choice”[All fields] OR “informed patient”[All fields] OR “informed client”[All fields] OR “informed consent”[MeSH] OR “informed consent”[All fields]
4	Communication	“communication”[All fields] OR “health communication”[MeSH] OR “health communication”[All fields] OR “risk communication”[All fields] OR “communicating risk”[All fields] OR “communication barriers”[MeSH] OR “communication barriers”[All fields] OR “patient communication”[All fields] OR “professional-patient relations”[MeSH:NoExp] OR “professional-patient relations”[All fields] OR “nurse-patient relations”[MeSH] OR “nurse-patient relations”[All fields] OR “physician-patient relations”[MeSH] OR “physician-patient relations”[All fields] OR “information dissemination”[MeSH] OR “information dissemination”[All fields] OR “access to information”[MeSH] OR “access to information”[All fields] OR “information seeking behavior”[MeSH] OR

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		“information seeking behavior”[All fields] OR “truth disclosure”[MeSH] OR “truth disclosure”[All fields] OR “risk perception”[All fields] OR “perceived risk”[All fields] OR “perception of risk”[All fields] OR “risk management”[MeSH] OR “risk management”[All fields] OR “patient safety”[All fields]
5	Follow-up/Continuity of care	“continuity of patient care”[MeSH] OR “continuity of patient care”[All fields] OR “followup”[All fields] OR “follow up”[All fields]
6	Education	“health education”[MeSH] OR “health education”[All fields] OR “health educator”[All fields] OR “patient education as topic”[MeSH] OR “patient education”[All fields] OR “health literacy”[All fields]
7	Adolescents	adolescent[MeSH] OR adolescen*[All fields] OR “adolescent behavior”[MeSH] OR “adolescent behavior”[All fields] OR “adolescent development”[MeSH] OR “adolescent development”[All fields] OR “pregnancy in adolescence”[MeSH] OR “pregnancy in adolescence”[All fields]
8	All sets combined (without adolescents)	((#1) OR (#2)) AND ((#3) OR (#4) OR (#5) OR (#6))
9	All sets combined (with adolescents)	(#7) AND (#8)

<sup>a</sup>Adapted, as needed, for searches of other databases. Other electronic databases searched were CINAHL, PsychINFO, HealthSTAR, POPLINE, EMBASE, Education Resources of Information Center (ERIC), Cochrane Database of Systematic Reviews (CDSR), Cochrane Central Register of Controlled Trials (CENTRAL), Database of Abstracts of Reviews of Effects (DARE), UK NHS Economic Evaluation Database (NHS EED), National Guideline Clearinghouse, UK National Institute of Clinical Excellence (NICE), Evidence for Policy and Practice Information and Coordinating Centre (EPPI-Centre), and Turning Research into Practice (TRIP).

<sup>b</sup>Medical Subject Headings.

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**Appendix Table 2.** Evidence on Impact of Reminder Systems in Clinical Settings to Improve Family Planning Outcomes

Reference/ Funding	Design/Setting	Population	Intervention	Outcomes	Results	Quality
<b>Oral contraception users</b>						
Lachowsky (2002) <sup>21</sup>  Funding source not stated  France	Prospective cohort study; 2 study groups  Setting: NR FU=3-6 months	975 females seeking OC prescription (new and continuing users); 93% aged ≤30 years  Intervention group: n=485  Control group received no reminder device: n=490  Recruitment: invited to participate by 180 participating gynecologists	Distribution of a credit card-sized reminder device which emitted an audible beep at a time selected by the participant to aid in establishing OC dosing as a daily routine; adherence assessed via survey at FU	<u>Medium-term:</u> increase correct use of contraception (OCs)  <u>Other:</u> barriers for clients	Intervention group had a significantly ( $p<0.005$ ) higher rate of perfect OC adherence (no missed hormonal pills) during the preceding 3 months compared with control group (41% vs 19%).	Level II-2; high risk for bias  <u>Strengths:</u> Multiple centers  <u>Weaknesses:</u> Selection bias (provider non-systematically determined study groups)  Participation rate unknown  Study groups appear to differ related to age and past OC usage (although statistical tests not conducted)  Self-report bias  Recall bias  Completion rate unknown  Short FU time for behavioral outcomes
Fox (2003) <sup>18</sup>  Magee-Womens Hospital, University of Pittsburgh,	Retrospective, historical nonrandomized CT; 2 study groups  Physician practices, hospital offices, family planning clinics and	Intervention group: 50 sexually active females aged 18–37 years (median age 21 years); new OC users; 84% white, 12% black, 6% NH;	Daily reminder e-mail messages on OC adherence sent at ~8:30AM ± 30 minutes to participants via blind copy to maintain privacy; participants instructed to check e-mail daily and reply to reminder to	<u>Medium-term:</u> increase correct use of contraception (OCs)  <u>Other:</u> barriers for clients	Perfect adherence (no missed hormonal pills) was significantly ( $p<0.05$ ) higher for intervention vs historical reference group during all 3 cycles (cycle 1: 78% vs 58%; cycle 2: 80% vs 59%; cycle 3: 72% vs 53%).	Level II-1; high risk for bias  <u>Strengths:</u> Multiple centers  <u>Weaknesses:</u> Selection bias  Comparability between study groups unknown (potential for confounding errors)

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General Clinical Research Center U.S.	university health centers, Pennsylvania  FU=3 months	72% full time students  Returned diaries at 3 months FU: <i>n</i> =40  Historical control group participating in a OC adherence study received no reminders: <i>n</i> =103 (group characteristics NR)  Recruitment:  flyer and newspaper advertisements	confirm receipt with replies logged; diary cards completed by participants to measure OC adherence		Although 64% of intervention participants expressed desire to continue receiving the daily e-mail reminders, only 25% were willing to pay \$5.00–\$10.00 per month for the service; participants also noted that the reminders would have been more helpful if the time sent could have been individualized.	Comparability between completers and noncompleters unknown  Self-report bias  Short FU time for behavioral outcomes
Hou (2011) <sup>19</sup>  Anonymous foundation  U.S.	RCT; 2 study groups  Planned Parenthood clinic, Boston  FU=3 months	82 sexually active females aged 18–31 years randomized from 103 women enrolled; new OC users; 79% white; 99% completed HS  73/82 (89%) had usable data at end of data collection	Daily reminder text messages on OC adherence sent at a designated time chosen by participants; participants were given an electronic monitoring device and 3 cycles of OCs; electronic monitoring devices monitored pill taking by sending a wireless signal to two servers (main and backup) each time participants opened the devices to remove a pill;	<u>Medium-term:</u> increase correct use of contraception (COCs)  <u>Other:</u> barriers for clients	Mean number of missed COCs did not significantly differ between intervention and control groups ( $4.9 \pm 3.0$ and $4.6 \pm 3.5$ per cycle, respectively, with number of missed pills increasing, but not differentially according to group, with each cycle over 3 months FU).	Level I; moderate risk for bias  <u>Strengths:</u> Randomization assignment was computer-generated  Allocation concealed  Investigators blinded to group assignment  80% participation rate

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		Intervention group: <i>n</i> =37	diary cards were also maintained		Although >85% expressed that they would continue or consider continuing to use the reminder system, 43% would not pay for the service; however, 57% stated that they would pay a median acceptable cost of \$5.00 per month for the service.	89% completion rate  FU rate ≤15% different between groups (90% for intervention and 88% for control groups)  Comparable study groups related to age, marital status, race/ethnicity, education, gravidity, parity, prior OC use, and prior use of reminders  Objective measurement of adherence (electronic monitoring device)  <u>Weaknesses:</u> Device did not mimic real-life OC dispenser  Short FU time for behavioral outcomes
		Control group received no reminders: <i>n</i> =36				
		Recruitment: females seeking care at Planned Parenthood clinic were invited to participate				
Hall (2013) <sup>a 16</sup>	RCT; 2 study groups	962 sexually active women aged ≤25 years who owned a cell phone with text messaging functionality and had no medical contraindications	180 daily text messages sent at a designated time chosen by women to serve as a pill reminder; messages included an introductory message, three reminders of how to change contact information or message time, 47 individual	<u>Medium-term:</u> increase continuation of use (OCs)	Intervention group had significantly ( <i>p</i> =0.005) higher OC continuation at 6 months compared with the control group (64% vs 54%; OR=1.44, 95% CI=1.03, 2.00 after adjustment for age, race/ethnicity, age at coitarche, pregnancy	Level I; moderate risk for bias  <u>Strengths:</u> Randomization made using random number table  Allocation concealed
Castano (2012) <sup>a 15</sup>	Urban family planning health center, Brooklyn, New York			<u>Short-term:</u> OC knowledge		
Affinity Health Plan Making a World of Difference						

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<p>Grant Program and William and Flora Hewlett Foundation U.S.</p>	<p>All participants received protocol-based routine care including contraceptive counseling by staff and an educational information handout detailing OC use, effectiveness, benefits and risks</p> <p>FU=6 months via telephone interview (although contact attempts began at 5 months and continued until 8 months for difficult-to-reach participants</p>	<p>to OC use requesting OCs</p> <p>Intervention group: <i>n</i>=480 (39% African American, 29% Hispanic, 27% white; 53% never pregnant); 346 (72%) with FU data</p> <p>Control group received routine care: <i>n</i>=482 (45% African American, 25% Hispanic, 26% white; 55% never pregnant); 337 (70%) with FU data</p> <p>659 women had OC knowledge assessment data at 6 months</p> <p>Recruitment: women seeking care at clinic were invited to participate</p>	<p>educational messages that were repeated up to four times, 12 two-way messages for quality control, and a final message; text messages addressed 6 major dimensions of OC knowledge; mechanism of action, effectiveness, use, side effects, risks, benefits</p>	<p>history, and OC experience).</p> <p>Mean OC knowledge scores at 6-months were greater among those in intervention (25.5) vs control group (23.7) (<i>p</i>&lt;0.001), corresponding to 7% vs 3% increase (<i>p</i>&lt;0.001).</p> <p>In multivariable linear regression models, receipt of text message intervention was strongest predictor of mean 6-month OC knowledge, with intervention vs control group participants scoring an average of 1.6 points higher (<math>\beta</math>=1.6, 95% CI=0.9, 2.2).</p>	<p>Comparable study groups related to baseline characteristics</p> <p>FU rates similar between study groups</p> <p>Analyses adjusted for potential confounding variables</p> <p><u>Weaknesses:</u></p> <p>Low participation rate (65%)</p> <p>Lack of blinding</p> <p>Self-report bias</p> <p>Recall bias</p> <p>Short FU time for behavioral outcomes</p>
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<b>DMPA users</b>						
Madlon-Kay (1996) <sup>22</sup>	Retrospective cohort study (via chart review); 2 study groups	184 sexually active DMPA users aged 13–50 years (mean age=23 years); 69% white, 21% black, 6% Hispanic; 86% receiving state medical assistance	Distribution of a wallet-sized reminder card containing the date of the next DMPA injection; a reminder postcard was also sent shortly before the upcoming injection appointment	<u>Medium-term:</u> increase correct use of contraception (timely DMPA injections)	Intervention was significantly ( $p<0.05$ ) associated with improvement in timeliness of DMPA injections; before the intervention, 64% of injections were received on time, while 76% of injections were received on time after the intervention was instituted.	Level II-2; high risk for bias  <u>Strengths:</u> Time of DMPA injections validated via clinic records  <u>Weaknesses:</u> Comparability between study groups unknown (potential for confounding errors)  Short FU time for behavioral outcomes
Funding source not stated	Family physician clinic, Minnesota	Number of participants in intervention group and control group (who received no reminders) NR.			The mean number of days late for an injection significantly ( $p<0.05$ ) decreased from 20 days late to 8 days late.	
U.S.	FU=3 months	Recruitment: charts of DMPA users reviewed				
Keder (1998) <sup>20</sup>	RCT; 2 study groups	250 sexually active females; new DMPA users; mean age 20.7 years; 68% black; 96% Medicaid insurance	A reminder letter was sent to DMPA users 2 weeks before the upcoming injection appointment and repeat phone calls were made if participants missed the appointment until they changed contraceptive methods, were lost to FU, or study completion	<u>Medium-term:</u> increase correct use of contraception (timely DMPA injections), increase continuation of use  <u>Other:</u> barriers for clinics	Rates of late and missed injections were similar between groups (data not shown).  Intervention did not improve DMPA continuation: 42.7% of intervention and 45.2% of control group continued DMPA through 12 months FU (RR=0.94, 95% CI=0.71, 1.25); although side effects were	Level I; high risk for bias  <u>Strengths:</u> Randomization assignment was computer-generated  Comparable study groups related to age, gravidity, parity, education, and marital status  Time of DMPA injections validated via clinic records
Funding source not stated	Magee-Women's Hospital clinic, Pennsylvania	Number of participants in intervention and control groups NR; control group participants				
U.S.	FU=1 year or 4 injections					

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		received a written appointment card only			thought to be a reason for discontinuation, the percentage of women reporting side effects did not differ between those who chose to continue DMPA (82.0%) and those who did not (83.8%).	FU time $\geq 1$ year
		Completed FU: $n=205$			Intervention was more intensive than would be easily incorporated into most office settings.	<u>Weaknesses:</u> Selection bias
		Recruitment: approached at clinic				Participation rate NR Comparability between completers and noncompleters unknown Allocation concealment NR Investigator blinding NR
Trent 2015 <sup>a</sup> 17	RCT; 2 study groups	100 urban adolescents aged 13–21 years using DMPA and had a cell phone with text messaging capability for personal use; 96% African American; 75% resided in low-income households	DepoText intervention participants received a welcome text message and daily text appointment reminders starting 72 hours before clinical visit, with option to cease messages by responding with their plans to attend visit. If patient responded ‘no’ an e-mail was automatically sent to nurse case manager who contacted patient to reschedule appointment. Intervention adolescents also received scheduled health messages regarding condom use for STI prevention, healthy	<u>Medium-term:</u> increase correct use of contraception (timely DMPA injections)	Proportion of adolescents who returned on time for their appointment was higher among those in intervention vs control group for the first (68% vs 56%) and second maintenance cycles after initiation (68% vs 62%) but not for the third maintenance cycle (73% vs 72%) (statistical testing NR).  Linear regression analysis found that adolescents in intervention group returned sooner after scheduled appointments than their control peers for the first maintenance	Level I; high risk for bias  <u>Strengths:</u> High participation rate (91%) Time of DMPA injections assessed using electronic tracking database  <u>Weaknesses:</u> Pilot study not powered to measure longitudinal efficacy  No data on duration of DMPA use at baseline  Randomization procedures NR  Allocation concealment NR  Lack of blinding

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al Sciences of the NIH U.S.	clinic appointment reminders via home phone  FU=9 months (3 injection cycles)	Recruitment: approached during clinic appointments and via phone contact with nurse case manager	weight management, encouragement to call the nurse for problems, and an STI screening reminder.	cycle after initiation ( $p < 0.05$ ) but not for the second and third maintenance cycles.	Unclear if outcome assessed among intent to treat women or only among those who returned for subsequent injections  Short FU time for behavioral outcomes
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<sup>a</sup>Newly identified evidence since 2015 review.

CT, prospective nonrandomized controlled trial; DMPA, depot medroxyprogesterone acetate; FU, follow-up; HS, high school; NR, not reported; NYC, New York City; NH, non-Hispanic; NR, not reported; OC, oral contraceptive; RR, relative risk; STI, sexually transmitted infection.