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## Impact of Contraceptive Education on Knowledge and Decision Making: An Updated Systematic Review

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### Abstract

**Context:** Educational interventions can help individuals increase their knowledge of available contraceptive methods, enabling them to make informed decisions and use contraception correctly. This review updates a previous review of contraceptive education.

**Evidence acquisition:** Multiple databases were searched for articles published March 2011–November 2016. Primary outcomes were knowledge, participation in and satisfaction/comfort with decision making, attitudes toward contraception, and selection of more effective methods. Secondary outcomes included contraceptive behaviors and pregnancy. Excluded articles described interventions that had no comparison group, could not be conducted feasibly in a clinic setting, or were conducted outside the U.S. or similar country.

**Evidence synthesis:** A total of 24,953 articles were identified. Combined with the original review, 37 articles met inclusion criteria and described 31 studies implementing a range of educational approaches (interactive tools, written materials, audio/videotapes, and text messages), with and without healthcare provider feedback, for a total of 36 independent interventions. Of the 31 interventions for which knowledge was assessed, 28 had a positive effect. Fewer were

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assessed for their effect on attitudes toward contraception, selection of more effective methods, contraceptive behaviors, or pregnancy—although increased knowledge was found to mediate additional outcomes (positive attitudes toward contraception and contraceptive continuation).

**Conclusions:** This systematic review is consistent with evidence from the broader healthcare field in suggesting that a range of interventions can increase knowledge. Future studies should assess what aspects are most effective, the benefits of including provider feedback, and the extent to which educational interventions can facilitate behavior change and attainment of reproductive health goals.

**Theme information:** This article is part of a theme issue entitled Updating the Systematic Reviews Used to Develop the U.S. Recommendations for Providing Quality Family Planning Services, which is sponsored by the Office of Population Affairs, U.S. Department of Health and Human Services.

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## CONTEXT

Despite the availability of a wide variety of effective contraceptive methods,<sup>1</sup> nearly half of all pregnancies in the U.S. are unintended.<sup>2</sup> Unintended pregnancy primarily occurs in women who do not use any contraception or use contraception incorrectly or inconsistently.<sup>3,4</sup> Contraceptive counseling provided by trained healthcare professionals may help sexually active individuals and couples identify contraceptive methods that are the most appropriate and effective for their lifestyle and preferences. An essential component of the counseling process is education. Contraceptive education aims to provide clients the information they need to make informed decisions about their use of contraception and correctly use the contraceptive methods they have selected.

The importance of contraceptive education can be seen in the impact of knowledge on method selection and correct and consistent use of contraception. Many women indicate contraceptive effectiveness is among the most important considerations for selecting a method<sup>5-9</sup>; consistent with this priority, better knowledge of contraceptive effectiveness is associated with adoption of more effective methods.<sup>10,11</sup> Conversely, inadequate knowledge of contraception is associated with incorrect perceptions of the risks and side effects of contraceptive methods, incorrect or inconsistent use, and method discontinuation.<sup>12-15</sup> Despite the importance of education, gaps in contraceptive knowledge are frequently documented.<sup>11,16,17</sup>

In 2011, the Centers for Disease Control and Prevention (CDC) and the U.S. Office of Population Affairs conducted a systematic review to better understand the aspects of educational interventions that can promote acquisition of knowledge for informed decision making and correct and continued use of contraception.<sup>18</sup> That review informed the development of the 2014 recommendations, Providing Quality Family Planning Services: Recommendations of CDC and the U.S. Office of Population Affairs.<sup>19</sup> The objective of this updated review is to summarize the body of evidence that was published subsequently.

## EVIDENCE ACQUISITION

### Definition of Contraceptive Education

This review complements findings of the accompanying review on contraceptive counseling,<sup>20</sup> defined as an interactive process between a provider and client intended to help the client achieve a reproductive health goal. This education review focuses more narrowly on the process of helping clients increase their knowledge of contraception so they can make informed decisions about using contraception, and then correctly and consistently use their chosen method.

### Development of Key Questions and Search Strategy

This systematic review is reported according to the PRISMA checklist.<sup>21</sup> The approach used was similar to that implemented in previous reviews<sup>22</sup> guided by an analytic framework showing the logical relationships between the population of interest, the interventions, and the outcomes of interest (Figure 1). This review of education interventions primarily focused on short-term outcomes related to contraceptive knowledge and decision making; studies were excluded if the intervention they described focused only on skills or behaviors. Of seven key questions (KQs; Table 1), the first five (KQ1–KQ5) asked whether educational interventions affected the following: contraceptive knowledge, including correct method use, risks and benefits, side effects, and method effectiveness; participation in decision making; satisfaction/comfort with services and decision making; attitudes toward contraception; and for interventions providing education on the full range of methods, selection of more versus less effective methods (KQ5). KQ6 was expanded from a focus in the original review on health literacy and asked if there were any barriers or facilitators for clinics/clients; KQ7 was added to address unintended consequences.

The search strategy included terms common to the other systematic reviews in this series on contraceptive counseling, reminder systems, and patient preferences for contraceptive counseling. Articles were identified from 16 electronic databases (Appendix Table 1, available online), and supplemented by hand searches of the bibliographies of identified articles. The initial and updated reviews identified articles published between January 1985–February 2011 and March 2011–November 2017, respectively.

Retrieval and inclusion criteria were developed a priori. Included studies were conducted in a clinic-based setting where family planning services: were provided or assessed an intervention that could be implemented feasibly in a clinic-based setting (e.g., not a multisession course series); contained a comparison group; were conducted in the U.S., Canada, Australia, New Zealand, or a European country categorized as “very high” on the Human Development Index<sup>23</sup>; and addressed at least one KQ. Studies focusing primarily on sexually transmitted infections were included only if they incorporated education on condom use to prevent pregnancy. For studies meeting inclusion criteria, outcomes of interest to other systematic reviews in this series (i.e., behavioral outcomes, such as contraceptive use, and long-term outcomes, such as pregnancy) also were evaluated because of their potential to be mediated by knowledge. Outcomes related to the KQs were considered primary outcomes; all other outcomes were considered secondary outcomes.

## Data Abstraction

Detailed information was abstracted by a team of four abstractors and reviewed by two authors for relevance to contraceptive education; differences were reconciled by consensus. In provider-enhanced interventions, a healthcare provider/educator interacted with the intervention to help participants in at least one group understand or use the information presented. By contrast, in provider-independent interventions a healthcare provider/educator did not go beyond the standard of care to facilitate participant understanding; the participant received the intervention either before or after, rather than during their appointment, and providers were given no specific instructions to help participants understand or make use of information. Studies were classified as evaluating more than one intervention if they included distinct mediums (e.g., written materials versus audio/video) or a provider-independent and a provider-enhanced intervention, each of which was separately compared with a control arm.

## Assessment of Study Quality and Data Synthesis

Study quality was assessed using a modification of the grading system developed by the U.S. Preventive Services Task Force.<sup>24</sup> Studies were first rated based on the U.S. Preventive Services Task Force evidence scale and then specific criteria were used to judge whether the study had high, moderate, or low risk for bias.

Data synthesis was primarily qualitative. Meta-analysis was not performed because of the large degree of heterogeneity across studies with respect to study design, study populations, lengths of follow-up, and outcomes measured.

Evidence from the initial and updated systematic reviews (Figure 2), including primary and secondary outcomes, is summarized in Figure 3 and presented in detail in Appendix Table 2 (available online). Primary outcomes from the review update are further discussed in the text.

## EVIDENCE SYNTHESIS

### Search Results

The systematic review identified 14,796 unique abstracts. From the title and abstract review, 14,591 articles were excluded and 205 were retrieved; 17 met inclusion criteria.<sup>25–41</sup> However, because three studies including the same population and intervention were described in multiple articles,<sup>25,29,30,32,34,39</sup> these articles were counted as 14 independent studies. Hand searches of references from included articles identified one additional article<sup>42</sup> providing further details on a study from the review update,<sup>25,32</sup> and one article,<sup>43</sup> providing further details on a study from the original review.<sup>44</sup> Together with evidence from the original review,<sup>18</sup> 31 studies described in 37 articles are included in this review update (Figure 2).<sup>25–61</sup>

Of the included studies, 17 were RCTs, of which nine were classified as having low,<sup>27,29,30,33,43,44,47,49,52,53,58,60</sup> six moderate,<sup>25,26,31,32,35,40,42,46</sup> and two high<sup>38,51</sup> risk for bias. Three were non-RCTs with separate groups of intervention and control participants;

of these, two were classified as having moderate<sup>45,54</sup> and one high<sup>57</sup> risk for bias. Nine used a pre-/post-test study design, of which three were classified as having moderate<sup>36,37,41</sup> and six high<sup>28,50,55,56,59,61</sup> risk for bias. Two final studies, also with high risk for bias, used a sequential cohort analysis in which one set of participants was studied prior to implementation of an intervention and was compared with another set of participants studied during the intervention period.<sup>34,39,48</sup>

Of the 31 studies identified, five included two interventions (one included a written intervention and an audio/video intervention<sup>46</sup>; four included a provider-independent and a provider-enhanced intervention<sup>29,30,43,44,47,52,53</sup>) that were each separately compared with a control arm, for a total of 36 interventions. In addition to being assessed for their effects on the a priori outcomes of interest (Figure 3), for three interventions, knowledge gains were evaluated for their further effect on these outcomes, including positive attitudes toward oral contraceptives (OCs)<sup>41</sup> and long-acting reversible contraceptives (LARC),<sup>33</sup> intention to use OCs,<sup>41</sup> and continued use of OCs.<sup>25,42</sup>

## Knowledge

The review update identified 12 interventions<sup>25,27,28,31–42</sup> assessed for their effect on knowledge (KQ1), including knowledge of correct method use, risks and benefits, side effects, and method effectiveness; of these, ten had a significant positive effect.<sup>25,27,28,31–37,39,41,42</sup> Details are described separately for provider-independent and provider-enhanced interventions.

**Provider-independent interventions.**—The review update identified seven provider-independent interventions.<sup>25,28,31–33,38,40–42</sup> Of these, three were non-interactive, assessing either a video,<sup>28</sup> written materials,<sup>41</sup> or text messages<sup>25,32,42</sup>; all three had a significant positive effect. The first<sup>28</sup> used a pre-/post-test analysis to assess the effect of a single online video session; the video was based on social and cognitive theories and provided information on intrauterine devices (IUDs). Immediately following the video, participants showed an increase from baseline in their knowledge that the IUD is more effective than the pill ( $p<0.001$ ) and that women who have never had a child can use an IUD ( $p<0.001$ ). The second intervention<sup>41</sup> also used a pre-/post-test analysis to examine knowledge among participants who received a comprehensive information brochure on OCs using either a standard evidence-based or a mental models approach. Participants receiving either type of brochure were combined into one group for analysis, which showed an increase in knowledge from baseline to immediate post-test ( $p<0.001$ ), and from baseline to 3 months ( $p<0.001$ ). The third intervention<sup>25,32,42</sup> was evaluated through an RCT and used daily text messages to address key domains of information for OCs (mechanism of action, effectiveness, use, side effects, risks, and benefits). From baseline to 6 months, knowledge scores increased 7% in the intervention versus 3% in the control group ( $p<0.001$ ). While the groups were similar at baseline, at 6 months intervention participants had higher scores related to mechanisms of action ( $p=0.004$ ); side effects ( $p=0.03$ ); effectiveness ( $p<0.001$ ); and potential OC benefits ( $p<0.001$ ).

The remaining four provider-independent interventions were interactive tools, each evaluated through an RCT.<sup>31,33,38,40</sup> Of these, two had a significant positive effect.<sup>31,33</sup> The first<sup>31</sup> was based on the theory of planned behavior and was intended to fill gaps in knowledge of LARC, while also providing information on the full range of methods. Knowledge among intervention participants increased from baseline to immediate post-intervention ( $p=0.001$ ).<sup>31</sup> The second<sup>33</sup> presented information from American College of Obstetricians and Gynecologists contraceptive education pamphlets through an interactive Facebook page with videos, diagrams, and games; control participants were given the same amount of time to review the education pamphlets on the American College of Obstetricians and Gynecologists webpage. Although control participants had higher knowledge scores at baseline ( $p=0.04$ ), Facebook participants showed greater knowledge gains ( $p<0.001$ ) and higher post-test scores ( $p<0.001$ ). Of the two interactive tools that did not have a significant effect, the first<sup>38</sup> was based on CDC's U.S. Medical Eligibility Criteria; it allowed participants to explore their contraceptive options and then request a prescription if they wanted a method requiring one; control participants were provided a similar tool with information on chlamydia infection. Immediately following use of their respective tools, intervention and control participants did not differ in their knowledge of relative method effectiveness (LARC versus tubal ligation,  $p=0.26$ ; patch/ring versus birth control pills,  $p=0.16$ ), or the effectiveness of condoms for preventing pregnancy ( $p=0.49$ ). The second tool<sup>40</sup> was a smartphone app that allowed participants to access information on a range of contraceptive options. Control participants received standard-of-care counseling from a health educator. Mean scores for knowledge related to the participant's selected method did not differ between the intervention and control groups immediately post-intervention ( $p=0.30$ ).

In combination with the original review,<sup>18</sup> 21 provider-independent interventions were evaluated for their effect on knowledge. Only one<sup>50</sup> of 14<sup>25,28,41,43,44,46,47,49–53,58–60</sup> non-interactive and two<sup>38,40</sup> of seven<sup>31,33,38,40,54,56,57</sup> interactive interventions did not have a positive effect on at least one outcome (Figure 3; Appendix Table 2, available online). Only one study compared delivery of the same information in an interactive and a non-interactive format, with participants in the interactive group showing greater knowledge gains.<sup>33</sup>

**Provider-enhanced interventions.**—The review update identified five provider-enhanced interventions evaluated for their effect on knowledge.<sup>27,34–37,39</sup> Of these, one included a video intervention<sup>35</sup> and four used written materials delivered as a script from a healthcare provider.<sup>27,34,36,37,39</sup> The video intervention,<sup>35</sup> evaluated through an RCT, was a 9-minute DVD presenting information on Nexplanon to abortion patients considering use of this method for the first time. During their appointment, intervention participants viewed the DVD and were then given the opportunity to ask their provider questions. Immediately post-intervention, a higher percentage of intervention versus control participants correctly responded to the effect of implants on mood and skin changes ( $p=0.004$ ), although they did not differ in knowledge related to duration of effectiveness, mechanisms of action, or return to fertility.

The first provider-enhanced intervention using written materials<sup>27</sup> also was evaluated through an RCT. Providers used a checklist to deliver information determined through a

Delphi interview process of 100 gynecologists to be essential for women considering OCs for the first time. Compared with the control group, the intervention group had a higher median knowledge score ( $p<0.001$ ), and for 15 of 22 questions, a higher percentage of participants with correct responses (range by response,  $p<0.05$ – $p<0.0001$ ). The next two interventions<sup>36,37</sup> similarly included the use of a flip chart to deliver information about emergency contraception during a 5-minute session; the first<sup>36</sup> was delivered in the waiting room of a women's clinic, and the second<sup>37</sup> was delivered at a grocery store pharmacy; both were evaluated through a pre-/post-test analysis. With the clinic-based intervention, knowledge scores increased from baseline to immediate post-test ( $p<0.001$ ), and remained elevated at 1–5 months ( $p$ -value not reported). With the pharmacy-based intervention, knowledge scores also increased from baseline to immediate post-test ( $p<0.001$ ); at 1–3 months follow-up, knowledge scores remained higher than at baseline ( $p=0.014$ ), although they were lower than immediate post-test scores ( $p<0.001$ ). The final provider-enhanced intervention using written materials<sup>34,39</sup> was evaluated through a sequential cohort analysis. During, but not prior to, the intervention period, providers used a checklist as a reminder to ask patients seeking walk-in services for pregnancy testing or emergency contraception about their pregnancy intentions and any unprotected sex in the past week. Providers then read a short script describing the effectiveness of LARCs relative to other methods, and offered participants emergency contraception or same-day LARC insertion, as appropriate. Immediately following their appointment, participants in the intervention versus the pre-intervention cohort had greater knowledge of LARC effectiveness and duration relative to other methods ( $p<0.05$ , both outcomes). However, findings related to knowledge of the reversibility of LARCs were mixed, as were findings related to knowledge at 3 months.

In combination with the original review,<sup>18</sup> a total of ten provider-enhanced interventions were assessed for their effect on knowledge; all ten had a significant positive effect (Figure 3, Appendix Table 2, available online).<sup>27,34–37,39,43–45,47,52,55</sup>

### Satisfaction/Comfort With Services and Decision Making

Four interventions in the review update were assessed for their effect on satisfaction/comfort with services and decision making (KQ3): three were provider-independent interventions assessed through an RCT,<sup>26,33,40</sup> and one was a provider-enhanced intervention assessed through a sequential cohort analysis.<sup>34,39</sup> Of the provider-independent interventions, the first<sup>33</sup> found that intervention participants given the opportunity to interact with a Facebook page, versus control participants allowed to view pamphlets with the same information, had higher composite scores for satisfaction with the counseling they received ( $p<0.001$ ). By contrast, the second intervention<sup>40</sup> found a lower percentage of intervention participants using a smartphone app, versus control participants receiving standard-of-care counseling from a health educator, who reported they were very satisfied with the counseling they received ( $p<0.001$ ). The third provider-independent intervention<sup>26</sup> was a video informed by the transtheoretical model of behavioral change designed to increase awareness and dispel misconceptions about LARC. Intervention and control participants did not differ as to whether they reported that they had been given sufficient information ( $p=0.94$ ); they had been able to make their own decision ( $p=0.21$ ); staff had respected their decision ( $p=0.54$ ); or that they were satisfied with their decision ( $p=0.94$ ) and counseling received



( $p=0.82$ ). The one provider-enhanced intervention assessed for its effect on satisfaction was the sequential cohort analysis that was previously described.<sup>34,39</sup> In this analysis, a higher percentage of participants in the intervention versus the pre-intervention cohort, having been read a short script on LARC effectiveness, reported that all their questions about birth control had been answered ( $p<0.001$ ), and that they were satisfied with the discussion ( $p=0.03$ ).

In combination with the original review,<sup>18</sup> seven interventions were assessed for their effect on satisfaction/comfort with services and decision making (Figure 3, Appendix Table 2, available online). Findings remained mixed. Six of the seven interventions were provider-independent interventions, with three finding a significant positive effect,<sup>33,48,60</sup> two finding no effect,<sup>26,51</sup> and one finding a significant negative effect<sup>40</sup>; only one provider-enhanced intervention was identified.<sup>34,39</sup>

### Positive Attitudes Toward Contraception

Two provider-independent interventions were identified in the review update that assessed attitudes toward contraception (KQ4), both with a positive effect. The first,<sup>41</sup> evaluated through a pre-/post-test analysis of a comprehensive information brochure, as described earlier, resulted in an immediate post-test increase in participants' scores for a positive attitude about OCs ( $p<0.001$ ); although scores dropped after 3 months, they remained higher than at baseline ( $p=0.036$ ). Moreover, the increase was positively associated with knowledge scores, both immediately post-test ( $r=0.284$ ,  $p=0.001$ ) and at the 3-month follow-up ( $r=0.206$ ,  $p=0.022$ ). The second intervention,<sup>33</sup> also described earlier, resulted in a significantly greater proportion of participants in the interactive Facebook group expressing a preference for implants in particular ( $p<0.01$ ), or LARC in general ( $p<0.01$ ). Moreover, knowledge was again an important factor. For both study arms combined, greater increases in knowledge (4%, 12%, 24%, and 36%) were associated with a greater increase in the RR of stating a preference for LARC (RRs: 1.06, 1.19, 1.43, and 1.71, respectively, 95% CIs in Appendix Table 2, available online).

In combination with the original review,<sup>18</sup> six different interventions assessed the effect of educational tools on attitudes toward contraception (Figure 3, Appendix Table 2, available online). Except for one intervention using written materials alone,<sup>46</sup> each had a positive effect.<sup>33,41,46,58,61</sup>

### Selection of More Effective Contraceptive Methods

The review update identified four interventions, assessed through three RCTs<sup>30,31,40</sup> that addressed the selection of more versus less effective contraceptive methods and also provided education on the full range of contraceptive options (KQ5; Figure 3, Appendix Table 2, available online). Two of these interventions were provider-independent interactive tools described previously: one filled gaps in knowledge of LARC, while also providing information on the full range of contraceptive options,<sup>31</sup> and the other presented methods in the order of effectiveness.<sup>40</sup> Neither resulted in differences in LARC uptake among intervention versus control participants (Gilliam et al.<sup>31</sup>:  $p=0.77$ , Sridhar and colleagues<sup>40</sup>:  $p=0.75$ ). The final study<sup>30</sup> found a positive effect of both a provider-independent and

a provider-enhanced intervention. This study assessed a computer-based contraceptive assessment module in which intervention participants received either a generic list of methods (provider-independent), or a list of methods tailored to their responses, which they were instructed to share with their healthcare provider (provider-enhanced). Among participants in the control group who were not exposed to any tool, 65% selected an effective method (i.e., injectables, pills, patches, or rings), and 15% selected a highly effective method (i.e., IUD or implant); in comparison to these percentage for the control group, selection of effective and highly effective methods, respectively, was greater in both the generic (78% and 24%,  $p<0.001$ ) and tailored information arm (75% and 22%,  $p<0.001$ ), and both intervention arms had increased odds relative to controls of selecting an effective method (generic vs control: OR=1.74, 95% CI=1.35, 2.25; tailored vs control: OR=1.56, 95% CI=1.23, 1.98).

No studies from the original review<sup>18</sup> evaluated the effect of educational interventions on selection of more effective methods.

### **Educational Attainment as a Facilitator or Barrier**

The review update identified four interventions (two provider-independent<sup>32,43</sup> and two provider-enhanced<sup>36,43</sup>), assessed through two RCTs<sup>32,43</sup> and one pre-/post-test analysis,<sup>36</sup> that asked whether a participant's education level impacted knowledge gains (KQ6; Figure 3, Appendix Table 2, available online). One study assessed the interaction of patient education with use of text messages,<sup>32</sup> one with written materials delivered by a provider using a flip chart,<sup>36</sup> and one with use of either a summary card or full-length brochure, delivered with or without interactive questions delivered by a provider.<sup>43</sup> With three of the interventions, knowledge gains were similar across education categories (text messages:  $p=0.49$ ; summary card or full-length brochure without interactive questions:  $p=0.9$ ; or with interactive questions:  $p=0.6$ ).<sup>32,43</sup> Education interacted with the final intervention in which providers delivered information using a flip chart: Increases in knowledge were greater for participants with a high school education versus those with some college education or above (136% vs 51%,  $p=0.016$ ).<sup>36</sup>

No studies from the original review<sup>18</sup> assessed the effect of educational attainment on knowledge gains.

## **DISCUSSION**

The initial and updated reviews identified 31 independent educational interventions using a variety of mediums (i.e., written materials, audio/videotapes, text messages, and interactive tools) assessed for their effect on knowledge.<sup>25,27,28,31–47,49–52,54–60</sup> All but three<sup>38,40,50</sup> of the 31 interventions had a significant positive effect, and 16<sup>25,27,32,33,35,42–44,46,47,49,52–54,58,60</sup> of those with a positive effect were evaluated through RCTs characterized by low/moderate risk for bias. These findings are consistent with the initial review<sup>18</sup> and other systematic reviews from the broader healthcare field,<sup>62,63</sup> in suggesting a wide range of educational interventions can help increase client understanding.

Although the original review<sup>18</sup> did not identify any interventions assessed for their interaction with client educational attainment, the review update identified four such interventions. With three,<sup>32,36,43</sup> increases in knowledge did not differ by educational attainment; the benefit of the fourth was greater for participants with less versus more education.<sup>36</sup> Although the educational level targeted by these interventions was not described, it is possible they were effective across educational levels because they were designed for individuals with lower levels of educational attainment. This would be consistent with recommendations from evidence-based tool kits from the broader healthcare field suggesting that health education materials be easy to interpret by clients with a fourth- to sixth-grade reading level,<sup>64–66</sup> and that certain basic strategies can be used to simplify information and promote comprehension for all clients. These strategies include appropriately presenting numeric quantities (e.g., by using common denominators and natural frequencies, such as “1 in 100 versus 5 in 100”),<sup>67–79</sup> limiting the amount of information presented, and highlighting important facts by placing them first.<sup>80–82</sup> Given the initial review identified only two studies that assessed the use of such strategies for simplifying the presentation of information (both of which had mixed results),<sup>44,60</sup> and no additional studies were identified in the review update, more detailed research specific to contraception is warranted.

Few conclusions can be drawn with respect to the secondary outcomes. For intentions to use contraception, the one secondary outcome considered a short-term outcome in the accompanying reviews, there was a positive effect in all but one<sup>35</sup> of six interventions.<sup>28,35,41,49,52,53</sup> However, with respect to medium- and long-term outcomes (i.e., contraceptive use, including correct, consistent, or continued use, and pregnancy), a positive effect was found in a smaller proportion of interventions, which may be because broader counseling interventions are needed to address outcomes associated with behavioral change and reproductive health goals.<sup>83</sup> Nonetheless, with three interventions, knowledge mediated additional outcomes of interest, including positive attitudes toward OCs<sup>41</sup> or LARCs,<sup>33</sup> intentions to use OCs,<sup>41</sup> and continued use of OCs.<sup>25,42</sup>

Finally, this update adds to evidence about the extent to which educational interventions are more effective with input from a health provider/educator. With respect to knowledge (KQ1), all ten provider-enhanced versus 18 of 21 provider-independent interventions had a significant positive effect. However, for satisfaction/comfort with decision making and services (KQ3), positive attitudes (KQ4), and selection of more effective methods (KQ5), only one provider-enhanced intervention was identified, thus providing little basis for comparison. Of note, however, four RCTs with low risk for bias (three from the original review<sup>44,47,52,53</sup> and one from the review update<sup>29,30</sup>) were identified comparing the same intervention with and without feedback from a healthcare provider. Results were mixed. In the first, participants who attended a face-to-face session with a health educator, versus those who received similar information through a video, made greater knowledge gains relative to controls.<sup>47</sup> In the second, participants who received either a simplified tool or a standard leaflet showed increases in knowledge relative to controls; however, although the increase relative to controls was even greater when the simplified tool was paired with interactive questions from a provider, there was no additive effect with the standard leaflet.<sup>44</sup> In the third RCT, the addition of a facilitator-led discussion session was no more effective than a

videotape alone for increasing knowledge relative to controls,<sup>52</sup> but did result in a higher proportion of participants redeeming vouchers for free condoms.<sup>53</sup> The final RCT, described above,<sup>30</sup> found that a contraceptive assessment tool was similarly effective at promoting selection of more effective methods with and without provider enhancement. However, only participants in the provider enhanced group showed higher odds relative to controls of using their selected method correctly and continuing at 4 months.<sup>29</sup>

One reason for the mixed results on provider feedback may be that educational tools by themselves are only effective for some types of learning. Research from other areas of health care has demonstrated the effectiveness of active learning techniques.<sup>84–87</sup> Such learning can be readily incorporated into interactive tools, many of which have been developed recently for contraception and included in this review, with mixed results.<sup>29–31,33,38,40</sup> However, these tools may not enhance more complex interactions. For instance, the teach-back method, in which clients restate the most important messages in their own words, has been shown to ensure comprehension,<sup>88,89</sup> and was recently used to lower IUD discontinuation rates.<sup>90</sup> Similarly, interactive tools by themselves may not be sufficient for other components of counseling that build upon knowledge, such as skill building or evaluating options in light of individual needs and preferences. More recently, contraceptive decision aids have been developed as provider tools for improving contraceptive counseling.<sup>91,92</sup> Research is needed to assess whether contraceptive decision aids developed for this purpose can further promote satisfaction with services, and attainment of behavioral and reproductive health goals.

### Limitations

This evidence summarizing the impact of educational interventions has several limitations, which should be considered when interpreting the evidence. Although several high-quality studies were identified for assessing the impact of educational interventions on knowledge, fewer were identified for the remaining primary outcomes targeted by contraceptive education. Seven studies assessed satisfaction/comfort with services and decision making, of which four were RCTs with low/moderate risk,<sup>26,33,40,60</sup> and three had high risk for bias.<sup>34,39,48,51</sup> Of the five studies assessing positive attitudes toward contraception, three were RCTs with low/moderate risk for bias,<sup>33,46,58</sup> and two had a high risk for bias or a less rigorous design.<sup>41,61</sup> Only three studies were identified that assessed selection of more effective methods, although all were RCTs with low/moderate risk for bias.<sup>30,31,40</sup> The authors were unable to identify any studies that addressed participation in the decision-making process. Additionally, as noted above, there was insufficient evidence to assess strategies for simplifying the presentation of information or the importance of input from a healthcare provider. Lastly, it is possible that additional articles meeting the inclusion criteria for this systematic review have been published since the updated search of the literature.

### CONCLUSIONS

This systematic review provides clear evidence that a wide range of educational interventions can effectively increase client understanding. Although the small number of studies addressing the remaining outcomes limited additional conclusions, some studies demonstrated that increases in knowledge can mediate additional outcomes of interest.

Future studies should assess what aspects of interventions for increasing knowledge and promoting informed decision making are most effective with respect to contraception, the benefits of including provider feedback, and the extent to which educational interventions can facilitate behavior change and attainment of reproductive health goals.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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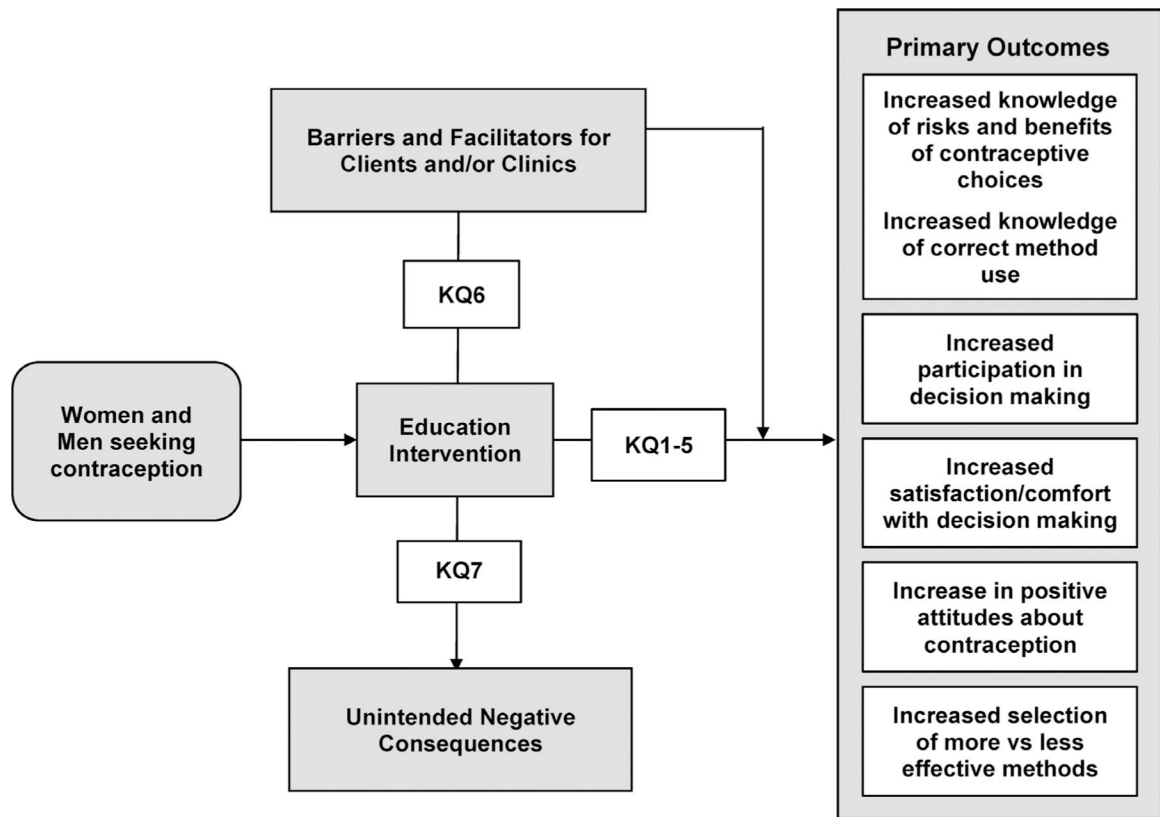
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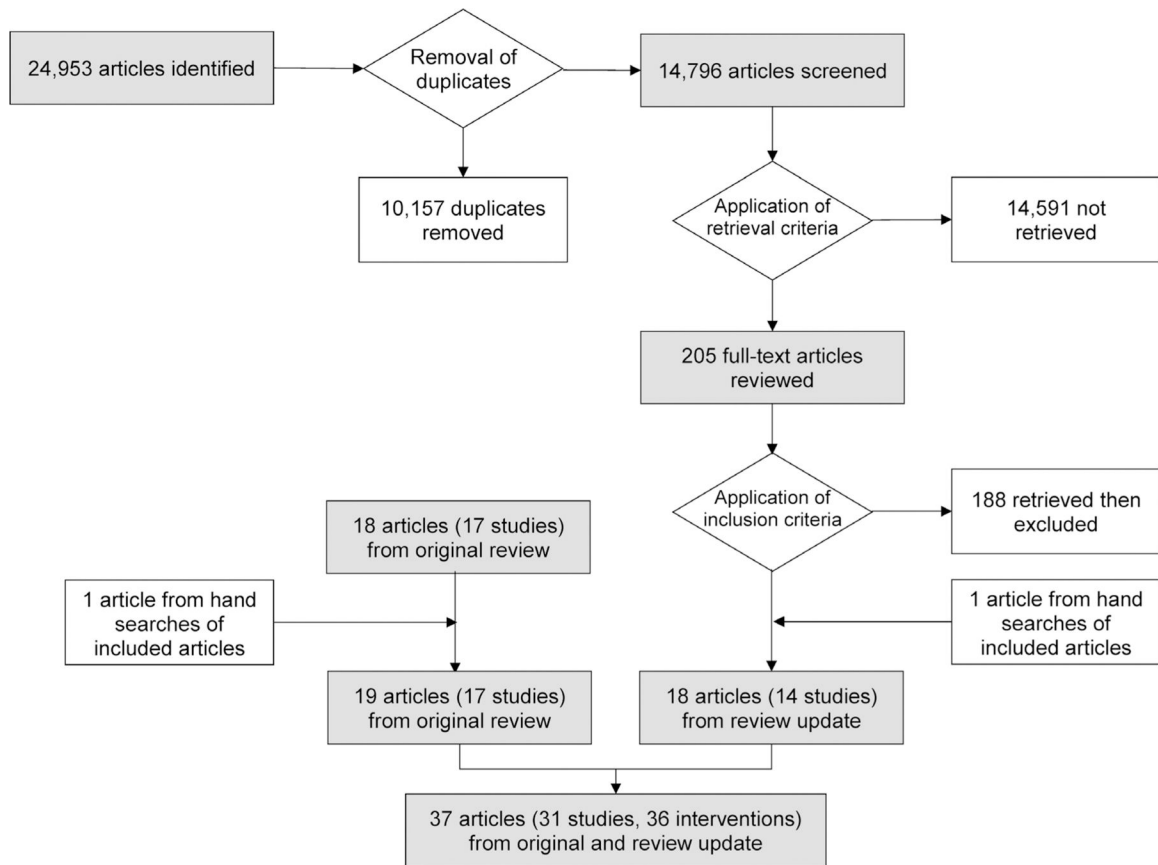


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**Figure 1. Analytic framework for systematic review of impact of contraceptive education.**  
KQ, key question.



**Figure 2.**  
Flow diagram—process of identifying studies included.

Outcomes	Mode of Delivery – Provider Independent					Mode of Delivery – Provider Enhanced				Total
	Interventions without input beyond the standard of care from a person, such as a health care provider or a health educator					Interventions with enhanced input from a health care provider or a health educator				# Unique Interventions
	Interactive Tools <sup>a</sup>	Written Materials	Audio or Videotape	Text Messages	# Unique Interventions	Interactive Tools	Written Materials <sup>b</sup>	Audio or Videotape	# Unique Interventions	
Number of interventions	8	8	7	1	24 <sup>c</sup>	2	6	4	12 <sup>d</sup>	36
<b>Primary Outcomes</b>										
KQ1: Knowledge, including correct method use, risks and benefits, side effects, and method effectiveness	▲▲▲▲ ▲●●	▲▲▲▲ ▲▲●	▲▲▲ ▲▲▲	▲	21 <sup>e</sup>	▲	▲▲▲ ▲▲▲	▲▲▲	10 <sup>f</sup>	31
KQ2: Participation in the decision making process	--	--	--	--	0	--	--	--	0	0
KQ3: Satisfaction/comfort with services & decisions	▲▼	▲▲	●●	--	6 <sup>g</sup>	--	▲	--	1 <sup>h</sup>	7
KQ4: Positive attitudes about contraception	▲	▲●	▲▲ <sup>i</sup>	--	5 <sup>j</sup>	--	--	▲	1 <sup>k</sup>	6
KQ5: Selection of more effective methods	▲●●	--	--	--	3 <sup>l</sup>	▲	--	--	1 <sup>m</sup>	4
KQ6: Barriers and facilitators for clinics or clients	--	●	--	●	2 <sup>n</sup>	--	●●	--	2 <sup>o</sup>	4
KQ7: Unintended consequences	--	--	--	--	0	--	--	--	0	0
<b>Secondary Outcomes</b>										
<b>Short-term</b>										
Intentions to use contraception (condom vouchers redeemed, plans for getting a LARC)	--	▲▲	▲▲	--	4 <sup>p</sup>	--	--	▲●	2 <sup>q</sup>	6
<b>Medium-term</b>										
Contraceptive use	--	●	▲ <sup>i</sup> ▲ <sup>r</sup>	--	3 <sup>s</sup>	--	▲ <sup>r</sup>	--	1 <sup>t</sup>	4
Correct, consistent or continued contraceptive use	●	●	▲	▲	4 <sup>u</sup>	▲●	--	●	3 <sup>v</sup>	7
<b>Long-term</b>										
Decrease in pregnancies	--	--	▲	--	1 <sup>w</sup>	▲ <sup>i</sup>	--	--	1 <sup>w</sup>	2

Each symbol = 1 intervention; studies with multiple types of interventions have a symbol for each type of intervention; ▲ intervention had a significant positive impact (p<0.05) on this outcome; ▼ intervention had a negative impact on this outcome; ● intervention did not have a positive or a negative impact; -- no studies identified for this outcome.

**Figure 3. Summary of evidence from systematic review on contraceptive education.**

<sup>a</sup>Includes decision aids, computer games, Facebook page, and smart phone apps.

<sup>b</sup>Materials provided or read as a script.

<sup>c</sup>Interventions described in Kirby et al. 1989<sup>49</sup>; Paperny and Starn 1989<sup>54</sup>; Reis and Tymchyshyn 1992<sup>56</sup>; O'Donnell et al. 1995<sup>52,53</sup>; Smith and Whitfield 1995<sup>59</sup>; Deijen and Kornaat 1997<sup>46</sup>; Little 1998,<sup>44</sup> 2001<sup>43</sup>; DeLamater et al. 2000<sup>47</sup>; Lindenberg et al. 2002<sup>50</sup>; Johnson et al. 2003<sup>48</sup>; Mason et al. 2003<sup>51</sup>; Steiner et al. 2003<sup>60</sup>; Roberto et al. 2007<sup>57</sup>; Schwarz et al. 2008<sup>58</sup>; Castano et al. 2012<sup>25</sup>; Hall et al. 2013,<sup>32</sup> 2014<sup>42</sup>; Garbers et al. 2012<sup>29,30</sup>; Vogt and Schaefer 2012<sup>41</sup>; Schwarz et al. 2013<sup>38</sup>; Gilliam et al. 2014<sup>31</sup>; Kofinas et al. 2014<sup>33</sup>; Davidson et al. 2015<sup>26</sup>; Garbers et al. 2015<sup>28</sup>; and Sridhar et al. 2015.<sup>40</sup>

<sup>d</sup>Interventions described in: O'Donnell et al. 1995<sup>52,53</sup>; Little et al. 1998,<sup>44</sup> 2001<sup>43</sup>; Chewning et al. 1999<sup>45</sup>; DeLamater et al. 2000<sup>47</sup>; Pedrazzini et al. 2000<sup>55</sup>; Whitaker et al. 2010<sup>61</sup>; Ragland et al. 2011<sup>36</sup>; Garbers et al. 2012<sup>29,30</sup>; Schwarz et al. 2014<sup>39</sup>; Lee et al. 2015<sup>34</sup>; Ragland et al. 2015<sup>37</sup>; de Reilhac et al. 2016<sup>27</sup>; and Michie et al. 2016.<sup>35</sup>

<sup>e</sup>Interventions described in: Kirby et al. 1989<sup>49</sup>; Paperny and Starn 1989<sup>54</sup>; Reis and Tymchyshyn 1992<sup>56</sup>; O'Donnell et al. 1995<sup>52,53</sup>; Smith and Whitfield 1995<sup>59</sup>; Deijen and Kornaat 1997<sup>46</sup>; Little 1998,<sup>44</sup> 2001<sup>43</sup>; DeLamater et al. 2000<sup>47</sup>; Lindenberg et al. 2002<sup>50</sup>; Mason et al. 2003<sup>51</sup>; Steiner et al. 2003<sup>60</sup>; Roberto et al. 2007<sup>57</sup>; Schwarz et al. 2008<sup>58</sup>; Castano et al. 2012<sup>25</sup>; Hall et al. 2013,<sup>32</sup> 2014<sup>42</sup>; Vogt and Schaefer 2012<sup>41</sup>; Schwarz et al. 2013<sup>38</sup>; Gilliam et al. 2014<sup>31</sup>; Kofinas et al. 2014<sup>33</sup>; Garbers et al. 2015<sup>28</sup>; and Sridhar et al. 2015.<sup>40</sup>

<sup>f</sup>Interventions described in O'Donnell et al. 1995<sup>52,53</sup>; Little et al. 1998,<sup>44</sup> 2001<sup>43</sup>; Chewning et al. 1999<sup>45</sup>; DeLamater et al. 2000<sup>47</sup>; Pedrazzini et al. 2000<sup>55</sup>; Ragland et

al. 2011<sup>36</sup>; Schwarz et al. 2014<sup>39</sup>; Lee et al. 2015<sup>34</sup>; Ragland et al. 2015<sup>37</sup>; de Reilhac et al. 2016<sup>27</sup>; and Michie et al. 2016.<sup>35</sup>

<sup>g</sup>Interventions described in Johnson et al. 2003<sup>48</sup>; Mason et al. 2003<sup>51</sup>; Steiner et al. 2003<sup>60</sup>; Kofinas et al. 2014<sup>33</sup>; Davidson et al. 2015<sup>26</sup>; and Sridhar et al. 2015.<sup>40</sup>

<sup>h</sup>Intervention described in: Schwarz et al. 2014<sup>39</sup>; Lee et al. 2015.<sup>34</sup>

<sup>i</sup>Indicates intervention had a marginally significant effect on this outcome ( $0.05 < p < 0.1$ ).

<sup>j</sup>Interventions described in Deijen and Kornaat 1997<sup>46</sup>; Schwarz et al. 2008<sup>58</sup>; Vogt and Schaefer 2012<sup>41</sup>; and Kofinas et al. 2014.<sup>33</sup>

<sup>k</sup>Intervention described in Whitaker et al. 2010.<sup>61</sup>

<sup>l</sup>Interventions described in Garbers et al. 2012<sup>30</sup>; Gilliam et al. 2014<sup>31</sup>; and Sridhar et al. 2015.<sup>40</sup>

<sup>m</sup>Intervention described in Garbers et al. 2012.<sup>30</sup>

<sup>n</sup>Interaction with educational level described in Little et al. 2001<sup>43</sup> and Hall et al. 2013.<sup>32</sup>

<sup>o</sup>Interaction with educational level described in Little et al. 2001<sup>43</sup> and Regland et al. 2011.

<sup>p</sup>Interventions described in Kirby et al. 1989<sup>49</sup>; O'Donnell et al. 1995<sup>52,53</sup>; Vogt and Schaefer 2012<sup>41</sup>; and Garbers et al. 2015.<sup>28</sup>

<sup>q</sup>Interventions described in O'Donnell et al. 1995<sup>52,53</sup> and Michie et al. 2016.<sup>35</sup>

<sup>r</sup>Significant increase over baseline, but significance of increase relative to controls not reported.

<sup>s</sup>Interventions described in Kirby et al. 1989<sup>49</sup>; DeLamater et al. 2000<sup>47</sup>; and Schwarz et al. 2008.<sup>58</sup>

<sup>t</sup>Intervention described in DeLamater et al. 2000.<sup>47</sup>

<sup>u</sup>Interventions described in Deijen and Kornaat 1997<sup>46</sup>; Garbers et al. 2012<sup>29</sup>; and Castano et al. 2012<sup>25</sup>; Hall et al. 2013,<sup>32</sup> 2014.<sup>42</sup>

<sup>v</sup>Interventions described in Chewning et al. 1999<sup>45</sup>; Garbers et al. 2012<sup>29</sup>; and Michie et al. 2016.<sup>35</sup>

<sup>w</sup>Intervention described in Schwarz et al. 2008.<sup>58</sup>

<sup>x</sup>Intervention described in Chewning et al. 1999.<sup>45</sup>

KQ, key question.

**Table 1.****Key Questions for Systematic Review on Impact of Education Interventions**

<b>KQ no.</b>	<b>Question</b>
1	Does contraceptive education increase comprehension of risks and benefits of contraceptive choices, including potential side effects, method effectiveness, and correct method use?
2	Does contraceptive education increase participation in the decision-making process?
3	Does contraceptive education increase satisfaction/comfort with services and decision making?
4	Does contraceptive education increase positive attitudes about contraception?
5	Does contraceptive education increase selection of more as compared with less effective methods?
6	What are the barriers and facilitators for clinics or clients related to the provision or receipt of education?
7	Are there any unintended negative consequences associated with contraceptive education?

*Note:* The key questions are put into context by the analytic framework presented in Figure 1.

KQ, key question.