Women’s values in contraceptive choice: a systematic review of relevant attributes included in decision aids

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Abstract

Background: Women can choose from a range of contraceptive methods that differ in important ways. Inadequate decision support may lead them to select a method that poorly fits their circumstances, leading to dissatisfaction, misuse, or nonuse. Decision support interventions, such as decision aids, may help women choose a method of contraception that best fits their personal circumstances. To guide future decision aid development, we aim to summarize the attributes of contraceptive methods included in available decision aids as well as surveys and interviews of women actively choosing a contraceptive method.

Methods: We conducted a systematic review to identify attributes of contraceptive methods that may be important to women when engaging in this decision making process. We performed a database search of MEDLINE/PubMed, Ovid EMBASE, OVID CENTRAL, Ovid PsycInfo, EBSCO CINAHL, Popline, and Scopus from 1985 until 2013 to identify decision aids, structured interviews and questionnaires reporting attributes of contraceptive options that are of importance to women. A free-text internet search was also performed to identify additional decision support tools. All articles and tools were reviewed in duplicate for inclusion, and a summary list of attributes was compiled.

Results: We included 20 surveys, 1 semistructured interview report and 19 decision aids, reporting 32 unique attributes. While some attributes were consistently included in surveys/interviews and decision aids, several were included more often in decision aids as opposed to surveys/interviews (e.g., STI prevention, noncontraceptive benefits, how the method is used, requirement of a healthcare provider), and vice versa (e.g., a woman’s vicarious experience with contraceptive methods). Key attributes mentioned in both surveys/interviews and decision aids include efficacy (29 total mentioned) and side effects/health risks (28 total mentioned). While a limited number of decision support tools were formally evaluated, many were not rigorously studied.

Conclusions: Many attributes were identified as potentially important to women choosing a method of contraception, but these were inconsistently included in the reviewed resources. Formal evaluation of decision support tools for contraceptive choice and involvement of users in the development process may lead to more user-centered design and implementation.

Keywords: Shared decision making, Decision aid, Decision support tool, Contraception, Birth control

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**Background**

Contraceptive use is widespread in the United States, with 99% of sexually active women in the United States having used a form of contraception at some time [1]. Currently, 62% of all women of childbearing age use some form of contraception. Use is inconsistent, however, and 11% of women who are at risk of unintended pregnancy are not using any form of contraception [1]. Moreover, nearly half (49%) of all pregnancies in the United States are unintended [2]. The finding that 95% of these unintended pregnancies are due to inconsistent and non-use of contraceptives despite their wide availability indicates that the problem is not the efficacy of contraception—the problem is whether people will use contraception and use it consistently [3].

When choosing a method of contraception, women are faced with a wide range of options and various attributes associated with these options to consider. When faced with complex decisions in the absence of adequate decision support, some women inevitably choose a method that does not optimally fit their personal circumstances. This poor “fit” is reflected in the fact that 40% of married women and 61% of unmarried women in the United States change contraceptive methods within a two-year period [4]. Some of this method switching may also be attributed to women’s evolving needs and highlights that women frequently re-visit this decision.

Shared decision making (SDM) is a process whereby a person makes decisions with a healthcare professional, considering the available evidence regarding options being considered, in the context of the person’s needs, values and preferences [5]. Increasingly, women are requesting the SDM approach in contraceptive choice [6]. Decision aids (DAs) can facilitate SDM by presenting complex and multifaceted attributes of these options in ways that are both evidence-based and easy for users to understand [7]. Because of the complexity of options and attributes about each to be considered, DAs may usefully facilitate the choice of contraception methods [8].

In order to understand if existing tools fit the needs of users, and to inform the development of future DAs for women considering contraception, we systematically assessed whether the attributes of contraceptive options that women are considering align with those reported in available contraception decision support tools.

**Methods**

A librarian experienced with performing systematic reviews related to SDM (P.E.) performed a literature search through MEDLINE/PubMed, Ovid EMBASE, OVID CENTRALL, Ovid PsycInfo, EBSCO CINAHL, Popline, and Scopus, from 1985 until January 2013. The strategy comprised subject headings and textwords describing all forms of family planning and reproductive control for women. This conceptual grouping was matched with methods to communicate with the person and facilitate informed choice, such as DAs, person education techniques, and pamphlets. Sample search strategies are included in Additional file 1. Authors were not contacted to identify additional studies.

Eligible studies were experimental or observational studies of any design published in English with or without comparator groups and targeting any population. Given the nature of our question, qualitative studies were included. Reports should describe the application of a DA or other method (e.g., survey, semi-structured interview) intended to facilitate sharing of information during a clinical encounter or in the setting of an actual decision about contraception (whether during or outside of the clinical encounter) and should report attributes relevant to a woman’s choice of contraception. Decision aids were not required to meet specific criteria in order to be included. Surveys of women not actively considering contraceptives were not eligible for inclusion. Studies were included regardless of reported outcomes.

In an effort to be as inclusive as possible, we also conducted free-text internet searches to identify online DAs for contraception that may not have been published in the database-indexed literature or formally studied. Inclusion of these resources was based on consensus of two reviewers.

**Analysis**

All attributes included in included resources were extracted and added to a master list. The master list was then examined for related attributes that could be classified together under a single category, and a reclassification round was used to confirm the stability of these categories. The main reviewer (K.D.W) and a second reviewer (A.L.) met at each stage to achieve consensus on attribute identification and classification; also, a 10% sample was extracted in duplicate by an independent reviewer to ensure the reproducibility of the process. Extraction was not confirmed with study/tool authors.

**Results**

**Search results**

Figure 1 reveals the flow of our search and selection process resulting in 28 articles for inclusion (10 surveys, 1 semi-structured interview, 7 DAs, 10 DA + survey), of which two (one DA only and one DA + survey) did not report the attributes sufficiently for extraction of meaningful data to be performed. Common reasons for articles not being included were not reporting on a method of patient engagement and not being used in the context of an actual decision regarding contraception. Five articles reported on the World Health Organization (WHO) Decision-making Tool for Family Planning Clients and Providers (DMT) and were considered together. Eight
other DAs were found online only. Table 1 describes included resources (19 unique decision aids, 20 surveys, and 1 semistructured interview) from which we could extract meaningful data. These surveys, interview, and decision aids have been used in the United States, Europe and the developing world.

Of the studies reporting decision aids, only five were randomized trials. One study utilized a pseudo-randomized design, six were quasi-experimental (usually comparing pre- and post-implementation of intervention), and five evaluated the decision aid with a questionnaire after use (with or without pre-intervention questionnaire). Details on the reported processes for developing included decision aids are reported in Additional file 2.

**Overarching categories**

After creating and reviewing the master list of attributes from the included resources, 32 unique attributes were identified. Each of these could be classified in one of four overarching categories, which were chosen by the authors after review of the master list: Mechanistic, Method Effect, Social/Normative, Practical (Table 2). An earnest effort was made to avoid redundant attributes and classify each attribute under only one overarching category, realizing that attributes and overarching categories are not mutually exclusive. **Mechanistic** captured aspects of how the method is used, including some implied considerations, such as whether the method required use of a needle or hormones and whether the method could be used post-coital (i.e., used after unprotected intercourse to prevent pregnancy). **Method effect** included the method’s efficacy for pregnancy prevention and noncontraceptive effects, including side effects, health risks, health benefits, and menstrual changes. **Social/Normative** encompassed how internal influences—such as a person’s prior experience or expectations—and external influences—such as vicarious experience (i.e., a woman’s understanding of contraceptive use as obtained through others [e.g., family and friends] who have used the methods and shared their experience) and partner support—impact contraceptive choice. **Practical** included attributes such as a person’s ability to obtain the method and the attribute’s compatibility with their means and sexual experiences.

**Attributes included in individual resources**

Figure 2 shows the number of resources that mentioned each attribute. Because decision aids and surveys from the same paper do not necessarily include the same
| Reference | Questionnaire/ interview included | DA included/ available | DA format | DA design methodology | Source | Setting | Population | Study design | Sampling | Primary outcome | Other outcomes |
|-----------|----------------------------------|------------------------|-----------|----------------------|--------|---------|------------|-------------|----------|----------------|---------------|
| Adinma 1998 [9] | 〇 | N/A | Literature search | Teaching hospital (Nigeria) | Pregnant women attending antenatal clinic | Questionnaire-based, face-to-face interview | Consecutive patients | Factors determining choice of contraception | Reasons for choice, correlation of choice with sociodemographic variables |
| Ameh 2007 [10] | 〇 | N/A | Literature search | Teaching hospital (Nigeria) | New clients attending a reproductive center | Questionnaire | Consecutive patients | Choice of contraceptive | Reasons for choice, contraception knowledge, source of contraception knowledge |
| Amin 2012 [11] | 〇 | N/A | Literature search | Family planning clinic (Pakistan) | Women seeking contraceptive services | Questionnaire | Convenience | Factors determining choice of contraceptive | Reasons for choice, correlation of choice with sociodemographic variables |
| BCS + [12] | 〇 | Cards | Web search | N/A | N/A | N/A | N/A | N/A | N/A |
| Bedsider - method explorer [13] | 〇 | Online method explorer | Web search | N/A | N/A | N/A | N/A | N/A | N/A |
| Bedsider - side by side [14] | 〇 | Online comparison grid | Web search | N/A | N/A | N/A | N/A | N/A | N/A |
| Bedsider - build your own [15] | 〇 | Online side-by-side comparator | Web search | N/A | N/A | N/A | N/A | N/A | N/A |
| Chewning 1999 [16] | 〇 | Computerized method explorer used before exam consultation | Literature search | Family planning clinics (Chicago, IL, USA; Madison, WI, USA) | Females ≤20 years interested in contraceptive | Pseudo-randomized, controlled trial | Consecutive patients | Contraceptive knowledge | Confidence in contraceptive efficacy, contraceptive adoption after stated intent to use, continued use of contraception, pregnancy |
| Study | Characteristics of included resources (Continued) |
|-------|---------------------------------------------------|
| WHO DMT [17-22] | Flipchart used during clinical encounter |
| | Literature search |
| | Various (Nicaragua, Mexico, Indonesia, USA) |
| | Various |
| | Quasi-experimental and randomized controlled trials |
| | Person-provider interaction |
| | Choice of contraceptive method, contraceptive use rates, provider acceptability of DA, person satisfaction with counseling |
| Choosing Wisely [23] | Online ideal method predictor |
| | Web search |
| | N/A |
| | N/A |
| | N/A |
| | N/A |
| | N/A |
| Costa 2011 [24] | Leaflet used before and during appointment |
| | Literature search |
| | Multiple centers (Portugal) |
| | Women ≥16 visiting gynecologist to start or restart combined hormonal contraceptive use and counseling |
| | Questionnaires before and after leaflet use and counseling |
| | Consecutive patients |
| | Choice of contraceptive |
| | Reasons for choice |
| Egarter 2012 [25] | Leaflet used during counseling |
| | Literature search |
| | European medical centers |
| | Women 15-40 years starting or restarting combined hormonal contraception |
| | Questionnaires before and after leaflet use |
| | Consecutive patients |
| | Difference between intended and selected method |
| | Reasons for choice |
| Fait 2011 [26] | Leaflet used during counseling |
| | Literature search |
| | Multiple centers (Czech Republic) |
| | Women 15-40 years who came to discuss combined hormonal contraception |
| | Questionnaires before and after leaflet use |
| | Consecutive patients |
| | Difference between intended and selected method |
| | Predictors of choice |
| Garbers 2012 [27] | Online ideal method predictor used before consultation |
| | Literature search |
| | Low-income family planning clinics (New York City, US) |
| | Women ≥16 attending family planning visit |
| | Randomized controlled trial |
| | Consecutive patients |
| | Effectiveness of contraceptive method chosen |
| Gold 1998 [28] | N/A |
| | N/A |
| | Literature search |
| | Multiple clinics (USA) |
| | Women aged 13-21 years attendees clinics |
| | Questionnaire |
| | Convenience |
| | Acceptability of contraceptive methods |
| | Menstrual, sexual and gynecologic history |
| Study | Year | Design | Methodology | Setting | Participants | Outcome Measures | Study Type | Notes |
|-------|------|--------|-------------|---------|--------------|-----------------|------------|-------|
| Goldstuck 1989 [29] | N/A | N/A | Literature search | Hospital-based and free-standing family planning clinics | Women who elected to use IUD for the first time | Questionnaire | Consecutive patients | Reason for choosing method |
| Johnson 2003 [30] | N/A | N/A | Literature search | Post-partum hospital ward (Oregon, USA) | Women hospitalized post-partum | Quasi-experimental | Consecutive patients | Receipt of DA on choice of contraception |
| Leon 2005 [31] | N/A | N/A | Literature search | Multiple health centers (Guatemala) | No direct patient participation studied (provider adoption was outcome) | Nonequivalent control group quasi-experimental trial | N/A | Adoption of DA and counseling strategy |
| Lele 2007 [32] | N/A | N/A | Literature search | Multiple outpatient clinics and private institutions (Spain) | Women 18-49 who consulted regarding contraception and initiated or re-initiated combined hormonal contraception | Questionnaire after leaflet use | Consecutive patients | Method acceptance |
| Madden 2012 [33] | N/A | N/A | Literature search | University research clinical site and community partner clinics (St. Louis, Missouri, USA) | Women 15-45 interested in starting a new contraceptive method | Questionnaire | Convenience | Impact of standardized counseling on choice |
| Mercx 2011 [34] | N/A | N/A | Literature search | Hospital or ambulatory gynecological practices | Women 18-40 years consulting for contraception | Questionnaires before and after leaflet use | Convenience | Ability to choose method after counseling |
| Method match [35] | N/A | N/A | Online method explorer | NR | N/A | N/A | N/A | N/A | Change of method choice after counseling, choice of method, following gynecologist recommendation |
| Title                           | Year | Type                  | Publisher       | Methodology                                                                 | Measures                                                                 |
|--------------------------------|------|-----------------------|-----------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|
| My contraception Tool [36]    |      | Online ideal method  | Web search      | N/A                                                                         | N/A                                                                      |
| My method [37]                |      | Online ideal method  | Web search      | N/A                                                                         | N/A                                                                      |
| Proctor 2006 [38]             |      | Written literature or educational video designed to be used separate from clinical encounter; not available for extraction | NR              | Literature search                                                          | N/A                                                                      |
| Proctor 2006 [38]             |      | Written literature or educational video designed to be used separate from clinical encounter; not available for extraction | NR              | Literature search                                                          | N/A                                                                      |
| Rubin 2010 [39]               |      | Literature search     | Family medicine practices (New York City, USA) | Convenience sample of reproductive-aged women who have heard of the IUD | Semistructured interview                                                 |
| Steiner 2003 [40]             |      | Literature search     | Five shopping malls across U.S. | Women 18-44 years | Convenience trial of three pregnancy risk tables with questionnaires before and after |
| Steiner 2006 [41]             |      | Literature search     | Convenience sample (Kingston, Jamaica and Bangalore, India) | Reproductive-age women aged 18-44 with basic English literacy | Randomized trial of three pregnancy risk charts with questionnaires before and after |
| Venkat 2008 [42]              |      | Literature search     | Gynecology outpatient clinics (New York City, USA) | Latina women | Questionnaire                                                                 |
| Venkat 2008 [42]              |      | Literature search     | N/A             | N/A                                                                         | N/A                                                                      |
| Venkat 2008 [42]              |      | Literature search     | N/A             | N/A                                                                         | N/A                                                                      |

**Table 1 Characteristics of included resources (Continued)**
| Study            | Year | Literature search | Representative panel | Women aged | Random sampling | Ability to identify noncontraceptive benefits and health risks of contraceptive | Self-perceived knowledge of contraceptive effects, interest in contraceptive effects, preferred source of information |
|------------------|------|-------------------|----------------------|------------|----------------|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Vogt 2011 [43]   |      | Literature search | Representative panel (Germany) | Women aged 18-24 | Random sampling from representative panel | Ability to identify noncontraceptive benefits and health risks of contraceptive | Self-perceived knowledge of contraceptive effects, interest in contraceptive effects, preferred source of information |
| Wall 1985 [44]   |      | Literature search | Private family practice and a family practice residency program | Convenience sample of women having some prior experience with contraception | Questionnaire | Convenience attributes relevant to choosing a contraceptive method | Predictive value of most relevant attributes on contraceptive choice, satisfaction with current method |
| Weldegerima 2008 [45] |      | Literature search | Community setting (Ethiopia) | Representative sample of reproductive age women | Questionnaire | Random sampling of residents | Awareness of modern contraceptives Attitudes toward modern contraceptive use, reasons for nonuse of modern contraceptive methods, most commonly preferred modern contraceptive |

†: See Additional files 1 and 2; NR: not reported; N/A: not applicable.
attributes, they do not necessarily lead to a mirrored appearance when added to the figure. In general, efficacy and side effects/health risks were prominent attributes in both surveys/interviews and DAs. Several attributes included in decision aids were not mentioned in surveys/interviews (i.e., needle phobia, post-coital, pre-sex preparation, postpartum compatibility, alarm signs, religious considerations).

### Table 2 Overarching categories and attributes influencing contraceptive choice

| Attribute | Included terms (similar attributes) |
|-----------|--------------------------------------|
| **Mechanistic** | Effort, convenience |
| Ease of use | Effort, convenience |
| Probability of omission | Mistake-proof, requirement of daily action |
| How used | Instructions for use, mechanistic explanation |
| Frequency of use | Timing, use pattern (e.g., three out of four weeks) |
| Return to fertility | Reversibility, permanence, control over method, childbearing plans |
| Effect latency | When method can be started, advanced planning necessary, works immediately |
| Foreign body phobia | Comfort with genital touching/genital exam/wearing patch |
| Needle phobia | |
| Use of hormones | Hormone levels |
| Requirement of healthcare provider visit | (for initiation and/or follow-up) |
| Post-coital | Works after sex |
| Pre-sex preparation | Action required prior to each intercourse |
| **Method effect** | Pregnancy prevention, “perfect use”, “typical use” |
| Efficacy | Factors reducing or maximizing efficacy, action required in case of method failure or imperfect use |
| Maximizing efficacy | |
| STI prevention | |
| Side effects/health risks | Safety, contraindications, drug interactions (e.g., antiretrovirals), latex allergy |
| Noncontraceptive benefits | Health benefits |
| Menstrual changes | Bleeding, cramping |
| Postpartum compatibility | Breastfeeding compatible |
| Alarm signs | Reasons to return to clinic, serious side effects |
| **Social/normative** | Partner compliance/involvement/acceptability/attitudes |
| Partner support | Partner compliance/involvement/acceptability/attitudes |
| Prior experience | Prior method use |
| Vicarious experience | Peer experience/advice, health professional input, media, peer/family acceptability/attitudes |
| Expectations | Perceptions or myths about methods and complications |
| Religions/moral considerations | |
| Concealability | Discreet, private (from partner or others) |
| Reputation | Popularity, artificiality, naturalness |
| Requires parental consent | |
| **Practical** | Ability to pay, how cost is distributed over time |
| Cost (financial) | Ability to pay, how cost is distributed over time |
| Effect on sexual pleasure | Effect on intimacy/spontaneity/libido |
| Availability | Where obtained |
| Level of sexual activity | How frequently having sex |

**Comparison of surveys/interviews and DAs**

While the limited number of resources precludes a quantitative statistical comparison of how often surveys/interviews versus DAs included each issue, some tentative observations can be made. Some issues were highlighted more often in decision aids compared to surveys/interviews: STI prevention (11 vs. 4), noncontraceptive benefits (11 vs. 4), how used (9 vs. 2), cost (6 vs. 2),
and requirement of healthcare provider (4 vs. 1). A woman’s vicarious experience with contraceptive methods was considered more often in surveys/interviews than decision aids (8 vs. 1).

Discussion

We summarize a number of surveys and decision aids that uncover which issues women may consider when choosing a method of contraception. Our results revealed that there are many important attributes women may consider when choosing among contraceptive methods and that these attributes are themselves heterogeneous in the way they are experienced (and named). While some tools (e.g., the WHO DMT) have been rigorously studied, many (in particular, the online tools) remain unstudied. Given that many women may be turning to online resources to help them make decisions about contraception, evaluation of these tools is imperative to ensure that tools address the needs of their users.

It is also imperative that decision making tools are evidence-based and that intended users are included in the development process to ensure that relevant attributes are considered. Tools can only be effective if they address the needs of their users, and in the case of contraceptive choice, this means addressing the attributes about methods that matter most to women. However, this goal sometimes proves elusive, as contraceptive choice is influenced by a multitude of socio-cultural, geographical, and personal factors such that a one-size-fits-all approach may not work. For instance, cost may not be a concern in areas where contraception is provided at no cost to the user, and menstrual changes could be seen as a positive or negative aspect of a contraceptive method, depending on the user. Moreover, the issues that matter most to a woman at a given point in her life may be different later on in life. The diversity of factors that influence contraceptive choice is likely reflected in the heterogeneity of issues included in the resources we reviewed—while some of the medical issues (e.g., efficacy, STI prevention, side effects) were almost unanimously included, some more practical considerations such as the burden of use associated with the method and socio-cultural attitudes about the methods were less-often considered.

Indeed, it was striking to see the differences observed in how frequently and inconsistently many issues were included in surveys/interviews compared to DAs. Medical considerations, such as STI prevention, noncontraceptive benefits, and requirement of a healthcare provider were highlighted more often in decision aids compared to surveys/interviews. In contrast, the vicarious experiences of women were considered in surveys/interviews far more often than decision aids. While we have no gold standard to identify the “true” perspective of women, if we assume that the surveys/interviews reflect the true perspective of women, the discrepancies observed between attributes included in surveys/interviews and DAs suggest that the true perspectives of users are not being reflected in the available tools. This is to say that tools may be including medical issues that women do not consider very important in lieu of including practical issues that matter to them more. Alternatively, given that many of the attributes included in surveys/interviews were investigator-driven, it is possible that both the surveys/interviews and DAs both may be reflective of investigator biases as opposed to what
truly matters to women. A third hypothesis is that contraceptive choice is such an individualized process that surveys and decision aids will always show variability in the issues they include based on who the users are. While it is clear that all of the issues we listed are important to some extent, some will be more important than others, and the relative importance of each will vary from user to user. Future decision aids need to keep this in mind and may need to be tailored to individual populations. Qualitative research within a target population may be useful prior to implementing a decision aid to ensure that the aid is of the utmost relevance to its users.

As the issues emphasized in DAs appear to reflect what providers feel are important to women when choosing a method of contraception, it remains unclear how providers influence patients’ choice of contraceptives and whether provider influence is concordant with patient preference. An international study of women in the United States and Europe observed that physicians have the greatest influence on what type of contraception women choose, with over half of all women seeking advice from health care professionals and less seeking this advice from family, friends, or the internet [46]. Another large study of over 18,000 women demonstrated that nearly half (47%) chose a different method than the one they originally planned to choose after receiving counseling from a health care provider [47]. This highlights the key role that providers play in influencing women’s choice of contraception.

Although patients want their physicians to be involved in contraception decisions, they want this involvement in the context of choosing a method that fits their personal values and preferences [6]. Do recommendations made by health professionals reflect their own personal biases or their patients’ true preferences and values? To examine the role provider preference plays on recommendations they make to patients, an international study of healthcare providers (over two-thirds of which were obstetrician-gynecologists) examined providers’ own choice of contraception, reasons for choice, and if these choices are concordant with recommendations they make to patients. The majority of healthcare providers used an intrauterine device, and most common reasons for use among these providers included the method matching their family situation (28%) and contraceptive efficacy (22.8%). These providers were more likely than others to recommend the method for patients who have completed planned childbearing (p < 0.001), and they were also more likely to not recommend oral contraceptives for patients who have not completed their childbearing plans (p = 0.011). This suggests that providers who use an intrauterine device are more likely to recommend to patients the method they use in favor of those they do not, and the reasons providers choose a contraceptive method may differ from reasons their patients do [48].

How do we, then, ensure that tools reflect the needs of their users (i.e., women)? Certainly, individualizing decision aids presents challenges. If a decision aid were to present all 32 unique attributes we list across the approximately 20 contraceptive methods available, it would certainly be unwieldy and introduce a heavy cognitive burden. Computer-based tools are a natural solution to this problem, as they provide a means to develop modular and easily-adaptable decision aids. For example, a decision aid could only present the options available to a woman based on stated preferences (e.g., permanent sterilization methods can be excluded if she states a preference for future childbearing) and could present only the attributes about these methods that a woman deems important. Indeed, some online tools we reviewed have taken this approach.

Development of modular tools for low-resource settings, however, produces certain challenges, as cost and the need for electricity limit use of computer-based decision aids. In the past, our group has developed decision aids using an “issue cards” approach, where users are given several cards, each which highlights a certain attribute about treatment options (e.g., cost, side effects, how it is used) compares across all of the options available to the user [49]. In low-resource settings, this design may be more feasible as the number of contraceptive options may be limited on the basis of availability. In this case, cards would only need to include the few options available, and a card could be generated for each attribute, with only the most relevant attribute cards being presented to the woman based on stated or elicited preferences.

Given recent advances in technology, computer-based solutions may not be far out of reach for low-resource settings. In 2007, Amazon.com introduced the Kindle E-reader. Initially designed as a book reader and sold for $399 USD, it featured a “e-ink” display which presents text and graphics on a screen with minimal glare and ultra-low power usage [50]. Today, a Kindle retails for $69 USD and can last weeks on a single charge [51]. The low power usage makes the device attractive for use in low-resource settings, and the low-glare screen is beneficial if used outdoors in the sun. Versions of the Kindle offer global cellular connectivity, permitting for wireless delivery of content to remote locations [52]. Based on its low cost, the Kindle may be a feasible computer-based decision aid delivery device for low-resource settings. To our knowledge, the Kindle has not been used as a decision aid delivery device before.

Certainly, factors other than the content of a decision aid will influence whether it is effective. While many of these aspects have not been formally studied, recent work from our group [Under review in Implementation Science] has shown that when providers do not use decision aids as intended, that providers involve patients less and knowledge transfer suffers. Therefore, effective
training interventions which ensure proper use of decision aids may make these tools more effective.

This study has several important limitations. For one, the degree to which each attribute was deemed important to women was not included in all studies nor was the quality of the evidence and risk of bias able to be assessed, given that unpublished online tools were included and these tools were not necessarily subject to quality control measures. Moreover, the major source of bias identified was that investigators often selected the items included on surveys and decision aids. This limited our ability to prioritize attributes according to relative importance and quality of evidence but did not impair our ability to generate a master list and classify attributes from which women might choose the most pertinent and important to them. Future meta-analysis could attempt to summarize how important women deem each attribute in relation to others to understand general trends, realizing that these preferences vary from woman to woman. The search strategy and extraction process also had several limitations, including that the search strategy did not provide a means for including paper-based decision aids that were not published in academic journals, the online search for “gray literature” was not systematic (and could have been affected by selection bias), and additionally, only 10% of data was extracted by 2 people independently. Strengths included the systematic search and duplicate study selection process.

Overall, contraceptive choice is a complex decision, marked with multiple considerations that must be carefully deliberated across an assortment of options. Moreover, the attributes that matter most differ from woman to woman based on individual context and may change for a given woman over time. Given the complexity of this decision, DAs might help women choose birth control methods that fit their values, needs and preferences. Ideally, if women find methods that fit their needs, values and preferences, this will lower rates of inconsistent use and nonuse and limit unintended pregnancies. While many DAs exist, they remain poorly studied, and aspects of effective DAs for contraceptive choice (including the attributes of methods that should be included) remain unclear. Here, we provide a framework for future DA development that takes into account attributes that may be considered when choosing a method of contraception and gives consideration for low-resource settings.

Conclusions
Many attributes were identified as potentially important to women choosing a method of contraception, but these were inconsistently included in the reviewed resources, perhaps reflecting the individualized nature of contraceptive choice. Decision aids should be tailored to include the attributes that are most important to users.

Additional resources
Readers interested in the community-level version of the WHO DMT may find it at http://www.who.int/reproductivehealth/publications/family_planning/9789241503754/en/index.html. WHO also publishes a decision making tool for people living with HIV that can be found online: http://www.who.int/reproductivehealth/publications/family_planning/9241595132/en/index.html.

Competing interests
The authors declare that they have no competing interests. This study had no specific funding source.

Authors’ contributions
KW envisioned the study, performed the majority of data extraction, and drafted the first draft of the manuscript. RA aided in data extraction, assisted in analysis of the results, and made substantial contributions to the early drafts of the manuscript. DC and JB aided in analysis of the results and provided critical revisions to later versions of the manuscript. VM and AL contributed to the design of the study, analysis of the results, and provided critical revisions to the manuscript. PE aided in the design of the study, including development of the literature search, and provided critical revisions to the manuscript. All authors have approved this final version of the manuscript for publication.

Additional files
Additional file 1: Sample search strategies.
Additional file 2: Details extracted from published studies regarding the process for designing decision aids, when reported.

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