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Michelle R. Chungtuyco

Jonathan D. Eldredge

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Michelle Chungtuyco, MD
Master of Science in Clinical Research (MSCR) Candidate
Biomedical Research Education Program
CTSC MSCR BioMedical Informatics Level 2 Course with Jonathan D. Eldredge, PhD
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Literature search strategy for economic evaluations of long acting reversible contraception (LARC)

MeSH terms: economics, intrauterine devices, desogestrel; cost and cost-analysis.

Introduction

Long acting reversible contraception (LARC) methods consist of the *intrauterine device (IUD) and subdermal implant*. These birth control methods provide highly effective contraception that last from 3-10 years. The IUD comes in both medicated (levonorgestrel-containing) and copper-containing form while the implant is inserted sub-dermally in the upper arm under local anesthesia and releases a small continuous amount of the etonogestrel. Despite high efficacy, LARC remains underutilized, with only 8.5% of contraceptive-using American women reporting its use (Finer 2012). The relationship between low LARC use and unintended pregnancy is documented (Secura 2013, Blumenthal 2013, Blumenthal 2011). In the United States, more than half of all pregnancies are unintended, with an estimated annual direct cost of \$4.6 billion (Trussell 2013).

There are two well-accepted methods of LARC initiation – immediate postpartum and interval insertion. In “immediate insertion,” LARC are placed within 72 hours of delivery, prior to hospital discharge. In contrast, “interval insertion” encompasses delayed insertion at 4-8 weeks postpartum as well as LARC initiation that is not related to pregnancy. Although immediate postpartum LARC initiation has been commonly practiced in other parts of the world for the last three decades (Grimes 2010), only a few centers in the US offer this service.

The American College of Obstetricians and Gynecologists (ACOG) recommends the use of LARC in the immediate postpartum period to aid in reducing unintended pregnancy rates and rapid repeat pregnancies (ACOG 2009, 2011). In the state of New Mexico, about 56% of pregnancies were unintended, with 58% ending in live births (NM PRAMS 2008). Data from the University of New Mexico Hospital (UNMH) in 2002 show that about 12% of postpartum women chose delayed LARC as their method of birth control. At best, only 60% of these women actually had a LARC placed (Ogburn 2005). More recent data from 2006-2011 indicate an increasing number of women who plan to use birth control after delivery, with preference for the implant and the IUD (Singh 2014).

Previous economic analysis of contraceptive methods show that, overall, LARC use leads to cost savings and quality adjusted life years compared to methods which require patient adherence such as oral contraceptive pills (Sonnenberg 2004, Secura 2013). Although previous research studies have been published regarding the cost effectiveness of LARC use in general, no cost-effective or cost utility study have directly analyzed immediate postpartum versus interval LARC use in the US.

Specific aims

Our **long-term goal** is to increase the practice and uptake of highly effective contraceptive methods in the US. The **overall objective** of this application is to perform *economic analyses* of the two timing strategies of LARC initiation. *Cost effectiveness and cost utility analyses* are methods for full economic evaluation that, combined, make use of the decision analytic models in order to report costs with each unintended pregnancy that is prevented and costs with each quality-adjusted life year (QALY) gained for any treatment or intervention (Gold MR 1996). The **central hypothesis** is that immediate postpartum LARC insertion is more cost-effective than interval initiation. To test our central hypothesis

and attain the objective of this application, we plan to pursue the following *three specific aims using the societal perspective*:

1. Cost utility analysis (CUA): Perform an incremental cost utility analysis (cost per QALY gained) of immediate postpartum LARC initiation compared with interval insertion through the creation of a decision analytic model.
2. Cost effectiveness analysis (CEA): Determine the incremental cost per unintended pregnancy that is prevented when LARC is initiated in the immediate postpartum period versus interval insertion.
3. Validate the model by conducting sensitivity analyses, using variables that may affect cost effectiveness and cost utility results.

Based on a review of the literature, *our working hypothesis* is that immediate LARC initiation, through an increase in patient compliance, will lead to a decrease in unintended pregnancy rates with its associated direct and indirect costs, and to an increase in quality-adjusted life years. Additionally, we *hypothesize* that these results are robust across varied time horizons, payer systems, and a wide range of probabilities and costs.

Replicable search strategy

In order to begin to achieve our aims, I conducted an extensive literature search on published economic evaluations on the IUD and contraceptive implant. Through the PubMed database, I performed separate searches during August 2014 for the IUD and during September 2014 for the sub-dermal implant. I considered all publications, whether they conducted the analysis specifically on LARC or in combination with other birth control methods. I did not apply any date and time restrictions since I wanted to capture all economic evaluations that have been completed in the past. Apart from gaining information on what methods have been done, I also wanted to ensure comparability of my unit of reporting with what was published.

Economic evaluations - Intrauterine Device (IUD)

Search # 1: On opening the MESH database at <http://www.ncbi.nlm.nih.gov/mesh>, I entered “Intrauterine device” in the search bar. I then selected the first definition of “Intrauterine Devices” (which includes both medicated and copper IUDs). I selected the subheading “economics” and did **not** restrict to MeSH Major Topic. I added it to the search builder and searched PubMed.

Search #2: Returning to the Mesh Database, I entered “Intrauterine devices” in the search bar. I clicked on the same definition and did not select any subheading. I added the term to the search builder and then entered “Economics” in the search bar. Economics is defined as “the science of utilization, distribution, and consumption of services and materials.” (Under the Health Care Category, economics encompassed costs and costs analysis). I selected on the definition and did **not** select Restrict MeSH Major Topic. I added the term to the search builder and searched PubMed.

Next, I went to the Advanced Search Page. On the advanced search builder, I selected *All Fields* and added Search #1. I proceeded to the second line and again, selected *All Fields* and clicked on Search #2. I chose the Boolean term OR and hit Search. I filtered the results to Human and English. This search provided a total of one hundred eighty two (182) articles on the IUD and Economics.

| | | |
|--|------|----|
| Search ("Intrauterine Devices/economics"[Mesh] AND Humans[Mesh] AND English[lang]) OR ("Intrauterine Devices"[Mesh] AND "Economics"[Mesh] AND Humans[Mesh] AND English[lang]) Filters: Humans; English | 182→ | 22 |
|--|------|----|

I reviewed the title and abstract (when available) of each of the articles and selected relevant publications based on the following inclusion and exclusion criteria.

Inclusion criteria: I considered all articles, including reviews and comparative observational studies, describing any type of economic evaluations of IUDs. Partial economic evaluations include cost descriptions, cost analysis, and cost-outcome descriptions, while CUAs, CEAs and cost-benefit analyses are considered full evaluations (Drummond 2005). I considered the publication as long as the IUD (both medicated and copper containing) was analyzed, whether alone or in combination with other contraceptive methods.

Exclusion criteria: I excluded articles from the search when it meets any of the following criteria:

1. Articles on IUD costs for non-contraceptive use (e.g. IUD use for heavy or dysfunctional menstrual bleeding)
2. Articles on IUD insertion costs post abortion
3. Articles on IUD costs for emergency contraceptive use
4. Articles on provider attitudes and practices on IUD insertion
5. Articles on IUD clinical risks and benefits alone, with no regard to costs
6. Articles on IUD cost marketing and other economic aspects such as patient incentives
6. Letters and editorials regarding IUD use
7. Reviews on the history and evolution of the IUD

Applying the inclusion and exclusion criteria yielded a total of twenty two (22) relevant articles (see Appendix A).

Economic evaluations - Sub-dermal contraceptive implant

I used the same search technique with regards to the contraceptive sub-dermal implant. Since the implant was FDA approved only in the mid 1990’s (compared to the IUD which has been available since the 1970’s), as expected, there is a significantly less number of published economic evaluations. Again, I did not apply any date or time restrictions to the search.

Search # 1: Opening the MESH database at <http://www.ncbi.nlm.nih.gov/mesh>, I entered “Etonogestrel” in the search bar. The heading will be mapped to Desogestrel. I clicked on “Desogestrel” and selected the subheading “economics”. I did **not** restrict to MeSH Major Topic. I added the terms to the search builder and searched PubMed.

Search #2: Returning to the Mesh Database, I entered “Desogestrel” in the search bar. I selected the same definition and did not select any subheading. I added the term to the search builder and then entered “Economics” in the search bar. As above, “Economics” is defined as “the science of utilization, distribution, and consumption of services and materials.” (Under the Health Care Category, economics encompasses costs and costs analysis). I clicked on the definition and did not select any subheading. I did **not** select Restrict MeSH Major Topic and added the term to the search builder. I then searched PubMed.

I navigated to the Advanced Search Page, and on the advanced search builder, I selected *All Fields*. I added Search #1. I proceeded to the second line, selected *All Fields* and added Search #2. I chose the Boolean term OR and clicked Search. I applied filters on Human and English. This search provided a total of thirteen (13) articles on the contraceptive implant and Economics.

| | | | |
|--|-----|----|----------|
| Search (("Desogestrel/economics"[Mesh] AND Humans[Mesh] AND English[lang])) OR (("Desogestrel"[Mesh] AND "Economics"[Mesh] AND Humans[Mesh] AND English[lang]) Filters: Humans; English | 13→ | 7→ | 6 |
|--|-----|----|----------|

Inclusion criteria: I included all economic evaluations on the sub-dermal contraceptive implant whether partial or full.

Exclusion criteria: The following exclusion criteria were applied while reviewing the search results:

1. Articles on Implant for non-contraceptive use
2. Articles on Implant insertion post abortion

Again, I did not restrict articles based on study type, country and date of publication. Application of the inclusion and exclusion criteria narrowed down the articles to seven (7). An overlap of one (1) article with the search strategy on the IUD described above was also noted. This remained in the IUD literature search and was eliminated as a duplicate here. This gave us a total of six (6) additional articles (*see Appendix B*).

Evaluation of References

My search strategy yielded a **total of twenty nine (28) relevant journals/articles**, 22 regarding the IUD and six on the implant. I reviewed the references of each article, and retrieved their abstracts as appropriate. Using this meticulous method, I was able to look up an additional twenty two (22) articles on the economic evaluation of the IUD (*see Appendix A*). Serendipitously, I came across three articles on the IUD that were published in 2014 that have not been cited by any article or even included in the original search results (*see Appendix A: Trussell et al. 2014, Trussell et al 2014 and Frost et al. 2014*).

Summary

In summary, I searched the PubMed database to come up with relevant articles on the economic evaluation of the IUD and contraceptive implant. Combined, I was able to find twenty eight (28) relevant journals and articles describing partial or full economic evaluations, as defined by Drummond in 2005. I used the MeSH term *intrauterine devices*, to pertain to both types of IUDs and the term *desogestrel*, which is the parent compound of the active ingredient of the implant. I combined them with the term *economics*, which encompasses cost and cost analysis under the heading of health economics. This technique, together with a very detailed and diligent search of the references, yielded an additional twenty two (22) relevant journal articles. All in all, I was able to come up with a total of fifty (50) publications on the economic evaluations of LARC.

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Appendix A: Relevant Search Results for IUD and Economics

(1-44)

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Appendix B: Relevant Search Results for Etonogestrel Implant and Economics

(1-6)

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