Review

State of knowledge on smartphone applications concerning contraception: A systematic review

Fanny Rousseau*, Sara Moreira Da Silva Godineau, Catherine De Casabianca, Cyril Begue, Christine Tessier-Cazeneuve, Guillaume Legendre

Angers University, Faculty of Medicine, France

A R T I C L E   I N F O

A B S T R A C T

Aim: Women's knowledge of contraception is incomplete and a wide variety of information sources are used. Since the advent of smartphones, 325,000 healthcare apps have become available.
Our aim is to conduct a literature review on smartphone applications for contraception.
Methods: 15 databases in English, Spanish and French were examined, which included studies published between 2007 and 2018 that describe or compare mobile applications for reversible contraceptive methods and interventional studies.
The quality of the studies was assessed using the Cochrane scale or a scale created by the authors.
Results: 1786 articles were listed and 22 were included in the main text.
In two randomised controlled trials, apps did not influence the choice of a contraceptive method. Two studies showed a significant improvement in knowledge after using an app.
Comparative studies reported a large number of apps, the majority of which contained only incomplete information and few interactive features.
Conclusion: Many applications deal with contraception, but few have reliable and exhaustive information. Further studies are needed to measure the impact of apps on observing compliance.

© 2018 Elsevier Masson SAS. All rights reserved.

Contents

Introduction

In France, contraception is very widespread. According to the Health Barometer 2016 [1], 92% of women aged 15–49 who are sexually active use some form of contraception. However, despite one of the highest coverage rates in the world, contraception remains a real public health problem. According to a French study by the DRESS in 2015, the rate of abortion is 144 per 1000 women aged 15–49 [2]. This rate has been stable since 2006. A study conducted on a worldwide level [3] estimated that 40% of pregnancies are unexpected and among this number, 50% end in an abortion.

Women's knowledge of contraception is incomplete, with persistent incorrect ideas [4] [5]. Outside the pill and condoms, other methods of contraception are relatively unknown [6]. Emergency contraception is indistinctly understood and its period of effectiveness is often underestimated.

The majority of women receive information but this is often incomplete and largely focused on the pill and condoms. Information sources that are frequently used are media and information shared by peers. Reliable sources, such as documents produced during communication campaigns or created by professionals are rarely mentioned [6].

Since 2001, French law has made sex and relationship education compulsory in schools at a rate of at least three sessions a year, but these are not carried out fully.

Therefore, spreading information and facilitating access to contraception appears to be an insufficient solution. Notably, the problem lies in the incompatibility between lifestyles and suggested methods of contraception. One solution could be to try to find tools adapted to women's lifestyles in order to try to improve knowledge and levels of use.

In a society where technology is omnipresent and where smartphones are widely accessible, especially among young people, the question of using an app (mobile/smartphone application) as a source of information on methods of contraception and an aid to help levels of use should be considered. In 2017, 325,000 healthcare apps were counted across all platforms overall [7]. More than half of French people are convinced by digital medical tools. However, although 56% of doctors equipped with a smartphone use medical apps in a professional setting, only 8% have recommended them to their patients.

Healthcare applications have already proven themselves in other fields: improvement of glycated hemoglobin in type 1 diabetic patients, and of medication compliance for the Parkinson disease and bowel preparation [8,9].

The aim of this study is to take stock of the knowledge of smartphone applications concerning contraception, by means of a literature review of articles which describe and evaluate apps, as well as articles which evaluate their potential influence on the population.

Methods

This was a narrative review of literature in accordance with the PRISMA-P method [10].

The following databases were examined between 1 December 2017 and 31 March 2018 in French, English and Spanish: PubMed, CAIRN, CISMEF, The Cochrane Library, ScienceDirect, SUDOC, Persée, Google Scholar, DUMAS, LILACS (Latin American and Caribbean Center on Health Sciences Information), POPLINE, The Grey Literature Report, Opengrey, ClinicalTrials and ICTRP. The research equation was: (contraception OR contraceptive OR contraceptif OR anticonceptivos OR contracepcion OR pillule OR pill) AND (smartphone OR mobile applications OR mobile app OR aplicaciones para moviles OR ordiphone OR applications mobiles). The equation was adapted to the function of each search engine.

Sources and bibliographic references were managed using ZOTERO software.

Screening studies

Once duplicates had been excluded, selection was carried out in two stages by reading the titles and abstracts and then reading the main text. The studies included were those published between January 1st, 2007 (beginning of smartphone sales) and February 1st, 2018 that describe or compare apps related to reversible contraceptive methods (oral contraception, implant, intrauterine device, ring, patch, progestogen injection, condoms and other barrier contraception, emergency contraception) and interventional studies that analyse the effects of these apps on the population.

The exclusion criteria were:

- Articles concerning natural methods of contraception (pulling out, studying menstrual cycle)
- Articles concerning permanent methods of contraception (male and female sterilisation)
- Articles concerning only global knowledge of health, sex education, STIs (sexually transmitted infections)
- Articles concerning overall treatments not focused on contraception
- Articles concerning instant messaging applications that allow interaction between 2 or more people
- Articles that do not study mobile application(s)
- Articles concerning applications that are not linked to contraception
- Articles that are not original
- Articles written in a language other than French, English or Spanish
- Main text could not be found

The studies were screened independently by 2 researchers. In the event of a difference of opinion, the articles concerned were discussed by the two researchers in order to come to a conclusion. The bibliographies of studies included were analysed to identify other articles that met the inclusion criteria and were not listed among the studies in the electronic databases.

Data analysis

The data were collected by each of the two researchers for each study included in the main text thanks to a pre-defined collection formula that gives: title, author, year of study and publication, country, type of study, inclusion criteria, participants, results, quality of the study. To evaluate the quality of the study, the Cochrane Collaboration's tool for assessing risk of bias was used for interventional studies with sample groups. A specific scale with 8 points was created for studies that describe apps. This is made up of 7 items: IMRAD presentation (Introduction, Methods, Results And Discussion) of the article (1 point), collection of applications on several computer platforms (1 point), controlled study (comparison of apps) (1 point), results in agreement with methodology (1 point), presence of a bibliographic source (1 point), declared conflicts of interest (1 point) and evaluation of the app using a scale that is validated (2 points) or not validated (1 point).

The data extracted were then pooled by the two researchers and made the object of a narrative study. They were summarised and grouped by topics.

Results

1786 articles were listed. After excluding duplicates, 1702 articles were analysed. 48 were eligible upon reading the title and abstract and 22 were included upon reading the main text. The flowchart is presented in Fig. 1. The degree of agreement between the two investigators was measured using Cohen's kappa test. This was evaluated at κ = 0.80 during the selection stage based on title and abstract and at κ = 1 during the selection stage based on the main text, which confirmed a strong agreement. The studies were classified into three categories: studies describing a single app (7/22), descriptive studies comparing several apps (7/22), interventional studies on a sample group (8/22). The majority of the articles were published between 2016 and 2017 (15/22), primarily in the USA (15/22). Fig. 2 shows the databases in which the articles are listed.

Studies describing an app

The characteristics of seven studies describing an application are detailed in Table 1. Three [11–13] were aimed at healthcare professionals to provide them with a tool for advising on an adapted method of contraception. Four were directed at patients: Pickpill [14] gave information on oral contraception, MyLARC [15] on LARCs (long-acting reversible contraception: implants and IUDs), MyChoice [16] on hormonal contraception and LARCs, and M-app [17] on emergency contraception. These studies had an average score of 3.7/8 [2–5] They provided few details on the
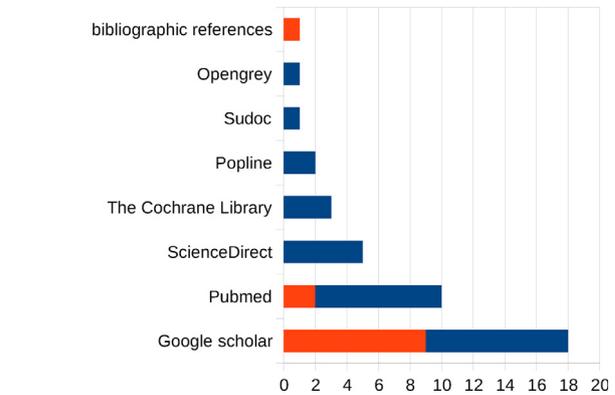
Fig. 2. Origin of included articles.
■ blue: article found in several database/ red: article found only in this database.
■.

informative content and functionalities included in the apps. The apps for which an article had been published followed medical recommendations or were created by healthcare professionals. Overall, users liked the apps.

Studies comparing apps

The characteristics of seven studies comparing applications are detailed in Table 2. Three out of seven studies concerned apps that

Fig. 1. Flowchart.
*"Hidden" duplicates = articles not having the same title but having the same content.

Table 1
Descriptive studies of an app.

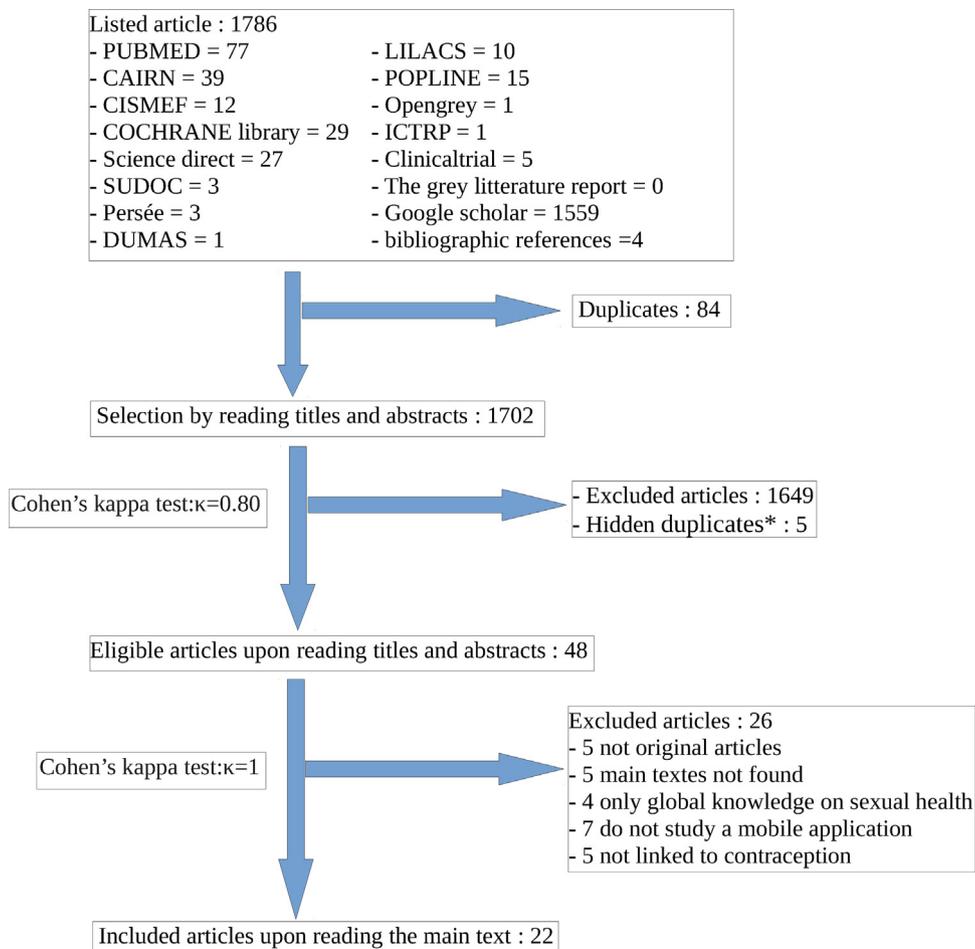| Title of the article	Name of the app	Main objective	Method	Principal results	About the app	Quality
MyLARC: a theory-based interactive smartphone app to support adolescents' use of LARC 2017[a] [15]	MyLARC	To present and evaluate an informative app about LARCs	App evaluated with a satisfaction questionnaire completed by 30 users of LARCs aged 14–19 years old	**Suitable and well liked support for giving information about LARCs** to adolescents who were satisfied overall.	- detailed content - created by healthcare professionals in line with medical recommendations - available on the Apple Store	5/8
Pickpill: software for smartphones to help follow treatment and provide recommendations in the event of forgetting to take oral hormonal contraceptives 2013[a] [14]	Pickpill	To create and evaluate an app that helps the user to take oral contraception and gives a course of action if the user forgets	App evaluated using a HAS questionnaire by 8 doctors and 12 patients	**Informative app on oral contraception with a reminder module and course of action in the event the user forgets.** The testers were satisfied overall with the simplicity and clarity of the messages.	- detailed content - based on HAS recommendations - Available on the Google Play Store	5/8
My choice: Navigating contraception application development 2016[a] [16]	My choice	To present an informative app on contraception with the goal of improving knowledge of LARCs	App not evaluated	MyChoice has **complete information on hormonal methods of contraception and LARCs**	- content has little detail - based on medical recommendations - available on the Apple Store	3/8
An evidence-based mobile app for emergency contraception awareness and education 2015[a] [17]	M-app	To present an app that informs women about emergency contraception methods in Canada	App not evaluated	Presentation of M-app, which is aimed at patients who want to have **information on emergency contraception**	- content has little detail - based on medical recommendations - available on the Apple Store and the Google Play Store	2/8
iContraception: a software tool to assist professionals in choosing contraceptive methods according to WHO medical eligibility criteria 2014[a] [11]	iContraception	To present and evaluate an app aimed at healthcare professionals for advice on contraceptives	App evaluated using a scale of pertinence and satisfaction by 54 healthcare professionals who had already used it	**iContraception is an aid in prescribing contraception. It is liked by healthcare professionals,** the majority of whom recommend it.	- content has little detail - based on WHO recommendations - available in English, French, Spanish and Portuguese, on the Apple Store and the Google Play Store	5/8
Development of a mobile app for family planning providers 2017[a] [12]	QFP app	To present and evaluate the QFP app, aimed at family planning professionals.	App evaluated by user satisfaction tool completed voluntarily by 69 professionals	**QFP app is an aid in prescribing contraception** that is visually attractive and easy to use; 80% would recommend to other professionals	- content has little detail - created by healthcare professionals - available on the Apple Store and the Google Play Store	4/8
Using mobile technology to support family planning counselling 2010[a] [13]		To present an app aiming to assist healthcare workers provide guidance about contraception	App not evaluated	Organisational and decision-making **app** aimed at **healthcare workers** that presents **available methods of contraception**.	- content in the app has little detail - based on BCS algorithm	2/8

[a] Year of publication.

provide information about contraceptives [18–20]. Two out of seven identified and evaluated those that help to prevent unintended pregnancies [21,22]. Two other studies carried out the same research, one with sex education apps (including family planning) [23] and the other with apps that give reminders to take oral contraception [24]. These studies had an average score of 5.86/8 [2–7] They listed an increased number of applications giving information on contraception but the majority contained incomplete information and few interactive functionalities (video, geolocalisation). The most frequently mentioned methods of contraception were studying menstrual cycle, oral contraceptives and condoms. The most popular apps were those providing information on the cycle and those that gave reminders to take contraception. The majority were aimed at the general population, and the others at healthcare professionals. The scales of evaluation used in these studies were very dissimilar, and were often created by the author in literature reviews but few had scientific validation. One study compared apps reminding users to take the pill. It concluded that these apps were reliable overall but that they should not be used as the only reminder.

A selection bias was possible for 5 out of 7 studies: two listed only free apps and three listed only those available on the Apple Store.

Interventional studies

Eight studies analysed the effect of these apps on the population and are described in Table 3.

Two randomised controlled trials [25,26] reported that apps do not influence the choice of long-term contraceptive method. However, one study noted an increase in interest in the implant after using the app. No conclusions on the impact of apps on knowledge of contraceptives can be drawn from these two studies given that this was a secondary aim and that the results were contradictory.

However, 2 out of 3 before/after interventional studies [27–29] specifically evaluated the impact of an app on knowledge of sexual health and showed a significant improvement after using the app. Knowledge was evaluated using variable pertinence questionnaires, according to studies.

Table 2
Comparative app studies.

Authors	Main objective	Method	Principal results	Quality
Lunde et al. March 2015[a] [19]	To identify and evaluate apps that provide information on contraception	- 41 search terms - found only on Apple Store - well-defined inclusion/exclusion criteria - evaluation by validated scale	- 1,218 apps listed,113 concerning contraception - 18 were included - **2 had exhaustive and clear information** - average score with APPLICATION scoring was 10.6/17 (7–15)	7/8
Perry et al. March 2015[a] [18]	To identify apps that provide information on contraception and evaluate those that can be used by professionals at family planning and education centres	- 41 search terms - found only on the Apple Store - inclusion/exclusion criteria not given - evaluation by validated scale	- 1,218 apps listed, 113 included - **6 were considered relevant for professionals at family planning and education centres** - average score with APPLICATION scoring of 11.1/17 (8–12)	7/8
Kalke et al March 2016[a] [23]	To identify and evaluate sex education apps	- 9 search terms - found on the Apple Store and the Google Play Store - well-defined inclusion/exclusion criteria - evaluation scale based on the literature	- 2693 apps listed, 15 apps included - **12 (80%) contained information on planning a pregnancy**	7/8
Mangone et al. 2014[a] [21]	To identify and evaluate apps that help to prevent unintended pregnancies	- 30 search terms - found on the Apple store and the Google Play store - well-defined inclusion/exclusion criteria - evaluation score based on literature - significant selection bias, report bias	- 6,805 apps listed, 218 included, few were reliable for preventing unintended pregnancies - 15 had a score ≥50/94 and ≥15/21 as contraception - 89 (41%) did not mention any method of contraception	6/8
Chen and Mangone July 2015[a] [22]	– To create an evaluation formula for apps that help to prevent pregnancies among adolescents and young adults – To identify and evaluate apps	- 52 search terms - found on the Apple Store and the Google Play Store - well-defined inclusion/exclusion criteria - mCAPP formula based on the literature - significant report bias	- 4043 listed, 22 included - **6 (27%) did not contain any information on contraception**	6/8
Gal et al. 2015[b] [24]	To identify and evaluate apps in the USA that remind users to take oral contraception and are available in English.	- 3 search terms - found on the Apple Store and the Google Play Store - only exclusion criteria were defined - evaluation formula was not described or validated	- number of apps listed unknown, 39 apps included - **32 (82%) send a reliable reminder**	6/8
Sridhar et al. May-June 2014[a] [20]	To identify and describe apps that give information on contraception	- 14 search terms - found only on Apple Store - well-defined inclusion/exclusion criteria - apps not evaluated - report bias, undeclared conflicts of interest	- 289 apps listed, 160 included, 16 aimed at healthcare professionals, 144 aimed at the population - following menstrual cycle (28%), information on sexual health (28%), contraception reminder (18%), localisation of family planning centres (15%) and games (11%)	2/8

[a] Date of including app.
[b] Year of publication.

Studies concerning apps aimed at healthcare workers in India [30] and Tanzania [31] [32] were of a very low quality. These reported an organisational improvement and made it possible to provide more exhaustive information on different types of contraception and a higher degree of satisfaction after the consultation.

Discussion and conclusion

Strengths and limitations of the review

The strength of our study was the large number of articles listed (1786), as well as large range of databases used (15). Furthermore, the Cohen's kappa coefficient used at the selection stage based on title and abstract, as well as the main text, showed a strong agreement between the two investigators.

One limitation of this study was the creation of the evaluation scale for articles describing apps for the needs of the study. This was made up of 7 items and did not take into account whether informative details about the app were included.

The quality of the articles included proved to be very heterogenous, which made it impossible to reliably conclude the impact of the app on knowledge and levels of contraception use.

The questionnaires evaluating knowledge were just as different in quality and exhaustiveness, according to the studies. The majority were created by the authors and not validated scientifically.

A large majority of the articles published on the subject came from the United States, a country where the rate of unintended pregnancies is the highest among developed countries and where sex education is primarily focused on abstinence rather than information and methods of contraception.

The only French study included is the one presenting and evaluating Pickpill.

Implications for practical application

iContraception could be used by French healthcare professionals. This application from Spain has been translated into four

Table 3
Interventional studies.

Authors	Name of the app	Main objective	Method	Principal results	Quality
Sridhar et al. 2015* [25]	Plan A Birth Control	To evaluate the impact of an app on the choice of contraception method	– RCT	**The app did not have a significant impact on the choice of a very effective contraceptive**	4 3
Gilliam et al. 2014* [26]		To evaluate the impact of an app used in the waiting room on the interest in LARCs	– RCT	**The app increases interest in the implant**	4 2 1
Mesheriakova et al. 2017* [27]	Health-E-You	To evaluate the impact of an app on knowledge of contraception and intentions of using more effective contraception.	– Prospective study – Before/after	**The app improves knowledge of sexual health** and positively influences adolescents in their intention to use a more effective form of contraception	6 1
Brayboy et al. 2016* [28]	Girl talk	To evaluate the impact of an app on knowledge of sexual health.	– Prospective study – Before/after – Small sample	The app is well liked and **improves overall knowledge of sexual health**	2 5
Travasso et al. 2016* [30]	Gyan Jyoti	To evaluate the impact of a visit by an ASHA who is assisted by an app or a memory card on levels of contraception	– Prospective study – Comparison of two groups – Report bias	**The app makes it possible to increase the levels of contraception** in rural India	2 4 1
Jackson et al. 2016* [29]	Sex 101	To evaluate the acceptability and impact of an app on risky sexual behaviour	– Prospective study – Before/after – Attrition bias	**The app improves knowledge of methods of contraception**, but does not show a significant reduction in risky sexual behaviour	1 6
Agarwal et al. 2016* [31]		To compare the types of contraception used by a sample group that consulted a health worker with or without an app	– Prospective study – Comparison of two groups	**The app increases the use of medium and long-term methods of contraception**	7
Braun et al. 2016* [32]		To evaluate the acceptability and benefits of an app according to healthcare workers and their patients	– Retrospective study – No comparison	The app has been accepted and **made it possible to deliver more extensive information** in a more confidential manner	7

* year of publication

Risk of bias evaluated by means of the Cochrane Risk of Bias Tool: a b c   a: level of bias is considered weak

b: level of bias is considered strong

languages and is available for free on the Apple Store and the Google Play Store. It provides information on the different types of contraception in line with WHO recommendations, notably on the eligibility criteria for using different contraceptives. It is a tool to help give prescriptions. However, the study does not specify if the information on the different types of contraception is complete.

For users of oral contraception, Pickpill may be suggested by healthcare professionals. It was based on the HAS recommendations and contained complete information, as well as a course of action if the user forgets. This app has been evaluated using a scientifically validated tool.

On the other hand, this literature review highlighted the difficulties for users to evaluate the informative content of the app. Notably, in the study by Lunde et al., the app that scored the highest in popularity had the lowest APPLICATION score.

The large majority of apps presented in this study were the result of medical recommendations or were produced with the help of healthcare professionals. This can certainly be explained by the publication bias. In fact, only seven apps benefitted from being presented by a publication, while the comparative studies listed more than 100.

This then raises the question of the app's certification by a competent authority so that patients and professionals can choose from a selection of reliable tools. The French Ministry of Health is currently working on implementing guidelines for labelling smart devices and health apps. In October 2016, the HAS published "Good practice guidelines on health apps and smart devices" [33]. This was made up of 101 good practices grouped into 5 areas: users, health content, technical content, security/reliability, use/usage. Therefore, the labelling guidelines should combine the new 2018 European regulation on personal data and the HAS guidelines on good practices.

Conclusion

Apps may be a tool to aid levels of use and prescription of contraception but few are a reliable and exhaustive source of information.

It would be interesting to carry out a comparative study in France that uses a standardised scale to identify and evaluate different applications linked to contraception. It would also be relevant to develop randomised controlled trials to measure the impact of apps on knowledge, contraceptive compliance or adapted management of missed hormonal contraceptive.

Acknowledgements

References

[1] Rahib D., Le guen M, Lydié N. Baromètre santé 2016 Contraception. [cité 30 oct 2018]. Disponible sur:. France: Santé publique; 2017. http://inpes.santepubliquefrance.fr/CFESBases/catalogue/pdf/1806.pdf.

[2] Vilain A. Les interuptions volontaires de grossesses en 2015. [cité 30 oct 2018]. Disponible sur. DRESS; 2016. https://drees.solidarites-sante.gouv.fr/IMG/pdf/er968.pdf.

[3] Sedgh G, Singh S, Hussain R. Intended and unintended pregnancies worldwide in 2012 and recent trends. Stud Fam Plann sept 2014;45(3):301–14.

[4] Tressol J. Intérêts et limites des pratiques et des outils pédagogiques utilisés dans le cadre de l'éducation des adolescents à la sexualité et la contraception 4 September. . p. 92.

[5] Aubin C, Jourdain Menninger D. La prévention des grossesses non désirées : information, éducation et communication. October [cité 8 juin 2018]. Disponible sur. inspection générale des affaires sociales; 2009. http://fulltext.bdsp.ehesp.fr/Ministere/Igas/Rapports/2009/104000048.pdf.

[6] Observatoire Régional de la Santé de Haute-Normandie. Contraception et IVG chez les jeunes de 15-18 ans en Haute-Normandie. [cité 18 juin 2018]. Disponible sur:. 2009. https://www.parents-atout-eure.org/IMG/pdf/Etude_ORS_contraception_jeunes_Haute_Normandie.pdf.

[7] Research 2 Guidance. mHealth economics 2017 – current status and future trends in mobile health. [cité 5 juin 2018]. Disponible sur. 2017. https://research2guidance.com/product/mhealth-economics-2017-current-status-and-future-trends-in-mobile-health/.

[8] Penfornis A, Clergeot A, Dardari D, Benhamou P, Schaepelynck P, Hanaire H, et al. O77 Amélioration de l'équilibre glycémique par le système de télémédecine DIABEO chez des patients diabétiques de type 1: résultats de l'étude Télédiab1. Diabetes Metab 2010;36(1 mars):A20–1.

[9] Delarue D. Les applications mobiles de santé sont-elles efficaces pour améliorer l'observance des patients en médecine générale? Revue de la littérature 2017;(1 déc):86.

[10] Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ 2015;349(2 janv):g7647.

[11] Lopez RG, Polo IR, Berral JEA, Fernandez JG, Castelo-Branco C. iContraception®: a software tool to assist professionals in choosing contraceptive methods according to WHO medical eligibility criteria. J Fam Plann Reprod Health Care 2014 October; jfprhc 2014-100966.

[12] Halsall V, Rogers J, Witt J, Song S, Nguyen HDH, Kelly P. Development of a mobile app for family planning providers. MCN Am J Matern Nurs. 2017;42 (October (5)):263.

[13] Routen T, Fulgence L, Mitchell M. Using mobile technology to support family planning counseling in the community. [cité 31 mai 2018]. Disponible sur:. 2010. https://www.researchgate.net/publication/228985366_Using_Mobile_Technology_to_Support_Family_Planning_Counseling_in_the_Community.

[14] Bonicel A. PickPill: un logiciel pour smartphones pour l'aide à l'observance thérapeutique et l'application des recommandations en cas d'oubli des contraceptifs hormonaux oraux [Thèse d'exercice]. Clermont-Ferrand, France: Université de Clermont I; 2013.

[15] Timmons SE, Shakibnia EB, Gold MA, Garbers S. MyLARC: a theory-based interactive smartphone app to support adolescents' use of long-acting reversible contraception. J Pediatr Adolesc Gynecol 2017(18 November).

[16] Carlson C, Plonczynski DJ, Vitucci D. My choice: navigating contraception application development. Comput Inform Nurs CIN. 2016;34(October (10)):423–8.

[17] Panjwani D, Cioca E, Drenikow BJ, Chodan C, Feng T, Li S, et al. An evidence-based mobile app for emergency contraception awareness and education. 2015 International Conference on Interactive Mobile Communication Technologies and Learning (IMCL). . p. 66–8.

[18] Perry R, Lunde B, Chen KT. An evaluation of contraception mobile applications for providers of family planning services. Contraception 2016;93(juin (6)):539–44.

[19] Lunde B, Perry R, Sridhar A, Chen KT. An evaluation of contraception education and health promotion applications for patients. Womens Health Issues Off Publ Jacobs Inst Womens Health. févr 2017;27(1):29–35.

[20] Sridhar A, Robinson AC, Roque K. Mobile applications for contraception information: a short overview. J Womens Health Issues Care 2016. . juillet 2016 [cité 7 juill 2017], Disponible sur https://www.scitechnol.com/peer-review/mobile-applications-for-contraception-information-a-short-overview-4yMm.php?article_id=4881.

[21] Mangone ER, Lebrun V, Muessig KE. Mobile phone apps for the prevention of unintended pregnancy: a systematic review and content analysis. JMIR Mhealth Uhealth 2016;4(janv (1)):e6.

[22] Chen E, Mangone ER. A systematic review of apps using mobile criteria for adolescent pregnancy prevention (mCAPP). JMIR MHealth UHealth 2016;4 (November (4)). . Disponible sur: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5122721/.

[23] Kalke KM, Ginossar T, Shah SFA, West AJ. Sex ed to go: a content analysis of comprehensive sexual education apps. Health Educ Behav 2017(28 déc), doi:http://dx.doi.org/10.1177/1090198117749259 [cité 22 févr 2018]; Disponible sur.

[24] Gal N, Zite NB, Wallace LS. Evaluation of smartphone oral contraceptive reminder applications. Res Soc Adm Pharm RSAP août 2015;11(4):584–7.

[25] Sridhar A, Chen A, Forbes ER, Glik D. Mobile application for information on reversible contraception: a randomized controlled trial. Am J Obstet Gynecol juin 2015;212(6)774 e1–7.

[26] Gilliam ML, Martins SL, Bartlett E, Mistretta SQ, Holl JL. Development and testing of an iOS waiting room « app » for contraceptive counseling in a Title X family planning clinic. Am J Obstet Gynecol 2014;211(November (5)) 481 e1–8.

[27] Mesheriakova V, Tebb K. Effect of an ipad-based intervention on sexual health knowledge and intentions for contraceptive use among adolescent females at a school-based health center. J Adolesc Health 2016;58(févr (2)):S74.

[28] Brayboy LM, Sepolen A, Mezoian T, Schultz L, Landgren-Mills BS, Spencer N, et al. Girl talk: a smartphone application to teach sexual health education to adolescent girls. J Pediatr Adolesc Gynecol 2017;30(févr (1)):23–8.

[29] Jackson DD, Ingram LA, Boyer CB, Robillard A, Huhns MN. Can technology decrease sexual risk behaviors among young people? Results of a pilot study examining the effectiveness of a mobile application intervention. Am J Sex Educ 2016;11(janv (1)):41–60.

[30] Travasso C. App helps to improve contraception uptake in rural India. BMJ 2016;352(3 févr):i667.

[31] Agarwal S, Lasway C, L'Engle K, Homan R, Layer E, Ollis S, et al. Family planning counseling in your pocket: a mobile job aid for community health workers in Tanzania. Glob Health Sci Pract 2016;4(juin (2)):300–10.

[32] Braun R, Lasway C, Agarwal S, L'Engle K, Layer E, Silas L, et al. An evaluation of a family planning mobile job aid for community health workers in Tanzania. Contraception 2016;94(1)27–33 juill.

[33] HAS. Référentiel de bonnes pratiques sur les applications et les objets connectés en santé (mobile Health ou mHealth). [cité 19 juin 2018]. Disponible sur:. 2016. https://www.has-sante.fr/portail/jcms/c_2681915/fr/referentiel-de-bonnes-pratiques-sur-les-applications-et-les-objets-connectes-en-sante-mobile-health-ou-mhealth.