

# e-Health Services to Support the Perinatal Decision-making Process: An Analysis of Digital Solutions to Create Birth Plans

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**Abstract:** This research aims to provide an overview of the existent digital solutions for birth plans' creation, intending to contribute for the advance of e-health services focused on the perinatal decision-making process. Primary data was found through a web search procedure. Better ranked options complying with the following criteria were included: (a) available online and for free; (b) pregnant people as the target audience; (c) labor and/or birth plan creation features; (d) in English. Four online services were found, and a two part study was conducted: a) a non-exhaustive benchmarking-like analysis of webpages where the digital solutions to create birth plans were provided, according to six dimensions; b) followed by a content analysis of the digital solutions, resulting in 13 categories emerging, that were scored according to their occurrence and completeness. "Consent and Information" category had the lowest score, what is considered critical for the full purpose of a birth plan creation; while, "Freedom", "Ambience and Equipment", "People", "Type of birth" and "Pain management" categories achieved the highest scores. Two solutions were considered particularly incomplete. Results show three solutions based on checklists, and one on visual icons. All solutions were based on a delivery approach, not including interactive or audiovisual components.

## 1 INTRODUCTION

The process of information analysis, making a decision and implementing it, known as informed decision-making is one of the most complex mechanisms of human thought (Zakerihamidi et al., 2015). It requires the development of critical and reflective thinking, in order to understand reality, to avoid prejudice, and to achieve historical and social emancipation (Machado et al., 2007).

Informed health decisions can be better supported when individuals can communicate and share their views with experts who understand the scientific evidence, and can present risks, benefits and alternatives (Stirling et al., 2017).

How the individuals are exposed to information may have considerable repercussions in how they balance risks and benefits (Slovic et al., 2005). Besides, access to data does not mean its appropriation and full understanding, as well as the ability to self-diagnose (Lundberg, 1989).

Avant-guard healthcare services are changing care model to be more person-centred (Mezzich et al., 2016) counting with preventive care to minimize clinical interventions (Jansen et al., 2013), prioritizing the parturient satisfaction on quality of care reforms and health-care delivery (Galle et al., 2015), following the World Health Organization (WHO) health system responsiveness framework (Mirzoev & Kane, 2017).

Studies show that pregnant women who participate actively in the decisions: feel more satisfied; have a more positive perception about the birth; tend to be more prepared; feel more in control; have a greater participation in the process, which contribute to reducing anxiety and stress during the process (Figueiredo et al., 2012; Lozoff et al., 1988; Hidalgo-Lopezosa et al., 2017).

Birth Plans gained expression as communication tools during the 80's, when WHO classified them as a top category of recommended practices, advocating safety reasons (WHO, 2006). however no

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standardized form was made available. Despite several renowned institutions all over the world endorsing childbirth literacy and the preparation of a birth plan (AAP & ACOG, 2012), there is a well-documented negative perception and controversy related to birth plans among the labor and delivery teams (Afshar et al., 2017), that can be due to the fact that not every detail can be predicted during labor (Whitford et al., 2014). More accurately described as a decision aid for birth preferences, this document is meant to enhance expectant parents involvement, and to support their decisions regarding labor and birth (Lothian, 2007), since for its creation it is required the discussion of options and clarification of perceptions, beliefs, fears and motivations, therefore triggering meaningful communication between expectant parents and healthcare workers, and ultimately resulting in awareness and knowledge (Goldberg, 2009).

Despite several studies showing that there is an opportunity to reach expectant parents through digital technology (Shiffler et al., 2017); and the fact that the Internet is being widely used across the globe as an educational tool to gather pregnancy-related information (Bjelke et al., 2016; Sinclair et al., 2018); digital health technologies to support expectant parents specifically the perinatal period (the time during labor and birth) were reported as one of their major unmet needs, that could be significantly improved (Robinson et al., 2018).

In order to understand how the Internet is supporting the birth plan's creation, an exploratory analysis of the webpages providing a digital solution to generate birth plans was conducted, plus a content analysis to reveal the covered topics. Results are expected to provide an overview of the current existent solutions, and to highlight how complete are they, when compared to each other, aiming to contribute to better understand if a care model is being clearly followed.

## 2 METHODS

Digital solutions were collected using a web search procedure, and the solutions included are the ones that better ranked while searching for the following queries: "birth plan generator", "create birth plan" and "birth preferences"; and, considered as a contribution for this study according to the following selection criteria: (a) available online and for free; (b) expectant parents as the target audience; (c) labor and/or birth plan creation features; (d) in English language. Redundancies were eliminated,

so the ones found to be similar were not included in this list. Data was gathered between February and May of 2020. The content out of the scope of this study was not analyzed, and consequently excluded, namely regarding infant care and non-immediate postpartum.

The analysis of the webpages of the online services consisted on a non-exhaustive benchmarking-like search (figures 2 to 5), following a set of dimensions (figure 1). This part of the analysis intends to make explicit the context where the digital solutions to create birth plans can be found, the technology needed and some user behaviors expected, to be possible to interact with it.



Figure 1: Dimensions for analysing webpages providing digital solutions to support the birth plan creation (authors' proposal).

The second part of the study was focused solely on the Plan dimension of the digital solution: in order to explore the material, following a content analysis approach (Bardin, 2008), the raw data was organized and clustered to make it possible to highlight their characteristics. Categories and related sub-categories that raised from the analysis are listed on Table 1, being mutually exclusive, homogeneous, relevant, productive, objective and reliable (Bardin, 2008; Esteves, 2006). The set of sub-categories emerged from a single plan, or from the combination of two or more plans.

The existence of each Category was addressed, and a score was assigned according to their completeness (Coutinho, 2011). Since a binary analysis was not possible, three different classifications were defined: a) Complete (2 points); b) Incomplete (1 point); c) Highly incomplete or Not mentioned (0 point).

The score allowed a total calculated as an overview for each plan (26 as maximum points), and at the same time, to analyze each category among the four plans (8 as maximum points).

Table 1: Categories and Sub-categories for the plans' analysis (authors' proposal).

Categories	Sub-categories
Introduction	Headline; Identification; Clinical History; Location.
Consent and Information	Update; Informed of options; Professional's decision.
Particular requirements	First language; Accessibility; Religion; To bring something; To record or to photograph.
Freedom	To move; To eat and drink; To breath; To vocalise; To push; To change position; What to wear; Others.
Ambience and Equipment	Light; Mirror or Low screen; Silence or Music; Equipment; Privacy.
People	Companion or Partner; Support; Students; Healthcare provider; Others.
Type of birth	Water; Vaginal; C-section; VBAC.
Early Interventions	Trichotomy (shaving); Enema (clyster); Perfusion (IV/saline lock); Cervical exams; Rupture or Stripping membranes; Urinary catheterisation; Alternative methods.
Foetal monitoring	Cardiotocography; Doppler; Others.
Pain Management	Anesthesia; Analgesia; Water; Others.
Medication	Induction or Augmentation; Others.
Late and Post interventions	Perineal relaxation; Forceps or Vacuum; Episiotomy; Perineal suture.
Umbilical cord and Placenta	Clamp or Cut; Blood or Stem cells; Discharge; Observation; End.

### 3 RESULTS

Four online services, with a digital solution each, were found. One solution was from a publicly-funded healthcare system, and three from private companies:

- National Health Service from the United Kingdom (NHS UK) (presented on section 3.1) - <https://www.nhs.uk/conditions/pregnancy-and-baby/how-to-make-birth-plan>;
- The Bump - <https://www.thebump.com/a/tool-birth-plan> (presented on section 3.2);
- She Knows - <http://pregnancyandbaby.com/calendars/articles/937331/birth-plan-creator> (presented on section 3.3);
- Mama Natural - <https://www.mamanatural.com/visual-birth-plan/> (presented on section 3.4);

#### 3.1 NHS UK Solution (NU)

The first analyzed solution was the *NHS UK* - National Health Service from United Kingdom. It consists of a single document available for download on the official website (figure 2). The usage and importance of creating a birth plan is explained on this specific webpage. Along with this introductory text, some link suggestions to other pages of the same website are recommended, enabling the user to explore related content.

The plan is available through public link download (no need to be registered), not being necessary to prove UK citizenship. The access was made from outside UK and allowed the visualization of a sets of checklists by topic, some including also a text box for comments. Each topic starts with a quick introduction to each topic, clarifying more technical terms. It counts with nine pages related to labor and birth, plus three regarding pediatric care. It includes a paragraph in each section to advice the best practice, to clarify some clinical terms, and sometimes to present alternatives. However, some questions do not require a clear consent or refusal, and the women only states if the topic was or not discussed with the midwife/doctor, there is a textbox under each of those questions that opens the space for comments that can be used, for example, to state preferences, thoughts and/or concerns. The legal recognition of this document is not clear, since there are no signatures or personal details addressed, besides the pregnant women's name.

Figure 2: Results from *NHS UK* solution analysis.

### 3.2 *The Bump* Solution (TB)

Second solution analyzed was *The Bump*, with a web page dedicated to the birth plan topic; despite this fact, it does not provide any explanation or suggest links to be consulted regarding the plan topics, only stating briefly the beneficial usage of a birth plan (figure 3).

It is not possible to edit electronically the document provided for download through a link, even with proper software to edit forms, since it is supposed to be printed and filled out by hand. It is presented as a birth plan template of six pages, with the header making it clear its purpose. The only textboxes presented are to be filled with identification on the top of the document. The following topics are grouped by background-color, following even/odd contrast colors (light teal and salmon). It is mostly arranged in a double column grid of answers using checkboxes, counting with options in favor, against and not sure about each mentioned topic.

The website announces a mobile application focused on pregnancy and parenting, which includes a similar checklist as a feature. However, it was not

	registered and public	responsive website	clean and flat design teal-salmon color schema	link to download	links to other pages
	✓	✓	✓	✓	✓
	document (.pdf)	black text over light-teal/salmon background colors logo	download and print it, to be filled out by hand	FORMAT checklist text boxes only for identification double columns 6 pages	OUTPUT digital document document for printing
	✓	✓	✗	✓	✓
	registered user	mobile application	material design pink-green color schema	FORMAT checklist android or iOS smartphone only available in some countries	OUTPUT send by email
	✓	✓	✓	✗	✓

Figure 3: (left and top): Results from *The Bump* solution analysis.

possible to analyze it in depth, since it's availability is limited to certain regions. On the other hand, the output from the mobile application is announced to be an email sent to the midwife/medical doctor.

*The Bump* plan does not include any text boxes for comments or notes; it only works as a checklist of preferences. It doesn't include any option of refusal; it states avoidance instead. Besides having clear spaces to identify all the parts involved, no other details are required, so the legal recognition of this document is not clear. This birth plan includes the possibility of check some clinical details that are relevant for the birth, and the women can clearly state the type of birth preferred.

### 3.3 *She Knows* Solution (SK)

The third analyzed solution consists in an online form available on the *She Knows* website (figure 4). The webpage, where the form can be filled and generated, includes some notes about the usage of a birth plan, stating the upside of creating two birth plans: one for the support team and another for the health providers.

To create the birth, expectant parents need to pick the sentences that describe their preferences. This means that several options are presented, and they need to check the ones that apply. Then they need to press a button in bottom that will submit the form, what triggers a new tab to open with a web page filled with the inserted data.

The document generated needs to be saved or printed, and it cannot be edited later on. Visually, this solution is not as appealing as the others analyzed in this study, but it is simple and clear. In addition, the sentences that were not checked in the form cannot be read in the final document, so it only contains information that the expectant parents find useful.

As a help system for filling the form of the plan, there are some text instructions available. It is possible to customize font, title, greetings and a pre-filled introduction. This form includes sentences to be checked as agreed. It is divided by sections that can be displayed or hidden in the final document. Some sections include links as suggestions to other web pages related to that specific topic. All sections include text boxes for notes that can be filled in. In some questions, the user can define which is the priority option to be considered, and which other options should be considered after that one.

Figure 4: Results from *She Knows* solution analysis.

### 3.4 Mama Natural Solution (MN)

The forth solution analyzed was Mama Natural that consists of a document made available in a webpage for free download (figure 5), and the web page is focused on clarifying the usage and importance of a birth plan. It does not contain information explaining the topics, but it suggests some links to other pages of the website.

The document is presented in a visual format, showing 20 icons, each with a simple key on the bottom of each. It can be inferred that pink icons are refusals (e.g.: “no medication”, “no episiotomy”), while the blue ones are requests and information of preferences. However, since the key is a brief explanation of the icon, it is not clear if it is an expectant parent preference or a definite refusal. This might be intended just to trigger discussion, since it is described in the web page that one of the goals of using this visual birth plan is to avoid conflicts between the expectant mother and the health care providers.

To customize the plan, expectant parents need to download a Word document, and use proper software for text edition. This template works by an exclusion process, which means the users can delete the icons which they do not agree with and keep the others. According to captions, this plan seems to assume that there is a set of procedures that will be done unless they state otherwise.

There are two areas: during labor and after delivery, organized by 5 columns of icons, which makes the plan really compact, up to two pages. The icons are clear and with a coherent design. Aesthetics seem to play an important role for readability, and it is the only plan taking advantage of semiotics from all four analyzed. However, few information is provided, also it is not clear the relation between competing alternatives (e.g.: “donating cord blood” and “delayed cord clamping”).

Figure 5: Results from *Mama Natural* solution analysis.

In order to understand which topics are covered by the plan of each digital solution, a content analysis was conducted, focusing on the presence and completeness of each one of the 13 categories that emerged. A sum-up of the obtained results is presented on Table 2.

## 4 DISCUSSION AND CONCLUSIONS

All the analyzed solutions assumed a document-delivery approach, with three of them requiring a specific software for text edition, and only one being an online generator. Three of the solutions listed options in a checkboxes format, and in some cases also displayed text boxes for the user to add some details; while one of the solutions opted by a semiotics approach, by providing symbols that could be deleted or kept, according to the user’s preference.

By collecting this data was possible to understand the context and format of the birth plans generators, and by carrying a content analysis it was possible to

Table 2: Content Analysis results by Category and by Solution.

Category	NU	TB	SK	MN	Total by Category
Introduction	● 1	● 1	● 2	○ 0	4
Consent and Information	○ 0	● 1	● 1	○ 0	2
Particular Requirements	● 1	● 1	● 1	○ 0	3
Freedom	● 1	● 2	● 2	● 1	6
Ambience and Equipment	● 1	● 2	● 2	● 1	6
People	● 1	● 2	● 2	● 1	6
Type of Birth	● 1	● 2	○ 1	● 2	6
Early interventions	○ 0	● 2	● 2	● 1	5
Fetal monitoring	● 1	● 2	● 1	● 1	5
Pain management	● 2	● 2	● 1	● 1	6
Medication	○ 0	● 2	● 2	● 1	5
Late interventions	○ 0	● 2	● 1	● 1	4
Umbilical cord and Placenta	○ 0	● 1	● 1	● 1	3
<b>Total by Solution</b>	<b>9</b>	<b>22</b>	<b>19</b>	<b>11</b>	

● Complete - scored 2 points: considered fully or close to fully complete, when the majority of sub-categories were covered.  
e.g.: "Fetal Monitoring" found on The Bump Plan: *I'd like fetal monitoring to be: a) Continuous Intermittent Internal; b) External; c) Performed only by Doppler; d) Performed only if the baby is in distress.*

○ Incomplete - scored 1 point: considered when some (at least one, but not the majority) of sub-categories were covered;  
e.g.: "Freedom" Category found on Mama Natural Plan: *Free Movement; Food and Drink for mama.*

○ Highly incomplete or Not mentioned - scored 0 points: considered when none of the sub-categories were covered, or when not presented as an option, but rather a statement of being a topic under discussion, and no option intended for consent/refusal listed.  
e.g.: "Late Interventions" Category found on NHS Plan: *I have/have not discussed with my midwife or doctor why an episiotomy might be necessary; I (would like/wouldn't like/not sure yet whether I would like/do not mind if) my partner or companion(s) to be with me if I have a forceps or vacuum delivery.*

point out the categories included in each birth plan, and how complete are they in comparison to each other. It is noticeable that the birth plans covered a wide set of topics, that were summed-up into 13 categories. However, the results reveal a massive

difference between two groups: a) *NHS UK* and *Mama Natural* plans lack completeness in the majority of the Categories; they do not cover five and three of the categories, respectively; and both have only one category considered as Complete; while b) *The Bump* and *She Knows* plans mention all categories; have higher numbers on completeness, with 9 and 6 fully or close to fully complete approach, respectively. These results may suggest that different care models are being followed, with the *The Bump* and *She Knows* plans being more person-centered by providing a high number of options to be addressed as decisions.

When analyzing from the category's perspective, it is noticeable that "Freedom", "Ambience and Equipment", "People", "Type of birth" and "Pain management" achieved 6 points each, being therefore the most complete categories among all plans. "Consent and Information" was the less addressed category among the plans obtaining 2pts. This result seems critical considering the purpose of a birth plan, and relevance of them for the human right standards *to information* and *to informed-decision* as a patient (WHO, 2019). By including options regarding "Update", "Informed decisions" and "Professional's decision", sub-categories related how the expectant parents want to deal with information, previous to and during labor and birth, the plans could help pregnant people and companions to manage their expectations more appropriately when requesting or facing the need for care (DGS, 2015). Possibly, those options were assumed as a right or a common procedure by the organizations/companies who created the plans. However, listing the options is considered a careful and safe position to make the provider aware of the need to request consent during each interaction, informing the pregnant person and companions what to expect along the process, and the options to deal with, since presenting them and enabling the participation in the decisions may have a positive influence in the pregnant person's satisfaction (Lothian et al., 2007). It could also be relevant to approach this category from both healthcare professional and expectant parents' views: the pregnant person and companions may have different expectations regarding when updates coming from healthcare professionals should happen, according to a certain frequency or upon specific stages; it could include options regarding how the expectant parents would inform their new/final decisions, or even change any decision according to the process at the moment.

Instead of following a mandatory protocol that requires the healthcare professional to obtain the

patient signature to accept a procedure upon admission, there are essential components during information exchange and involvement to assure comprehension, adequacy of information and freedom of choice (Goldberg, 2009; Ford et al., 2003). Several studies show the importance of training healthcare professionals in this domain, being also fundamental to train expectant parents so they can make informed-decisions regarding labor and birth (Hindley & Thomson, 2005). It is crucial to recognize expectant parents' individual autonomy, which characterized by auto-determination, skills to set goals, personal values, freedom to choose and plan, and to proceed accordingly (Espanha, 2009).

The informed-decision making process is one of the most complex mechanisms of human thought, since it requires the development of critical and reflective thinking (Machado et al., 2007). Creating opportunities to put the patient in the center of the decision process can help to foster the compliance with the established expectant parents rights. They have already been incorporated in different national and international regulations (e.g.: English common law, Napoleonic Code, US Constitution and Bill of Rights, Helsinki Declaration) and are highly endorsed by global organizations (e.g.: World Health Organisation, Médecins sans Frontières and Amnesty International) (Krogstad et al., 2010).

This study provided an overview of the current existent solutions, and classified how complete are they in comparison to each other. However, the results were not crossed with scientific evidence-based data, it could be interesting in a near future to establish how they comply with current healthcare guidelines by WHO (2018) - which were within the scope of our previously published work (Leite & Almeida, 2021).

The analyzed solutions range from a long scroll on a webpage, to a nine pages' document. However, if the solutions were truly interactive generator tools, dynamic features could be included to facilitate the display of so that amount of categories, along with the following proposals: a) to have a system for locking the mutually exclusive options of the same question; b) to have a system for sorting the options of the same question according to preference; c) to include a visualization of dependencies in relation to other past and future options to be chosen; d) include full and relevant information to support expectant parents while marking the options (not as external referrals); e) to clarify which options will be available according to possible occurrence of events.

Future work on this topic could also be conducted in order: to understand the optimal extension of the

information to be provided, to avoid cognitive burden and maximize reading comprehension (Zisman-Ilani et al., 2017); to define which options (categories and sub-categories) should be included in a birth plan; and to assess the knowledge built and awareness gained through the usage of such digital solution.

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