



## **Introducing AI to the NHS Maternity services: A Proposed Strategy to move Maternity Services to the 21st Century**

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## Introduction

Maternity services are a vital part of the health system, providing the care to mothers and their babies. In the recent years there has been a rising awareness of the risks that can be associated with pregnancies, through different national reports like MBRRACE-UK (Mothers and Babies: Reducing Risk through Audit and Confidential Enquiries), the Ockenden, and the NHSP (Newborn Hearing Screening Program) reports. Hence, multiple national policies are being implemented in preventing adverse outcomes and avoiding the repetition of preventable complications.

On a wider medical scale, there are national policies, like GIRFT (Getting It Right First Time), that focus in the precision of correct management and improvement of the care of patients.

However, during the Covid Pandemic there has been a long disruption of elective healthcare services. As a result, once the lockdown was eased, the healthcare was burdened with a huge backlog. Until now, there are outpatient referrals where the patients might take months before they are seen by a clinician.

In non-urgent clinical scenarios, some delays can be acceptable, but when it comes to maternity care time can be a critical factor in the provision of the necessary care.

Adding to that the fact that regardless the best efforts of health personnel, there is always the “human factor” that has to be taken into consideration. The extra profusion of workload after the pandemic, as well as the ongoing growth of the human population, inevitably requires additional human effort, time, and concentration. Understandably, with such disequilibrium between the required daily assignments and the available health personnel, the burden of workload, inevitably, we run through the risk of committing all three types of human errors, as per Rasmussen’s model: lapse error, slip error, and mistakes.

At this point, a safe approach to relieve some of the workload from health professionals will allow clinicians to focus on more substantial daily activities. Therefore, comes the role of technology.

Artificial Intelligence (AI) has emerged as a transformative force in healthcare, with promising patient outcomes, enhanced efficiency, and cost savings. The application of AI in national maternity services can play a vital role in ensuring safe and high-quality care for expectant mothers and their new-borns.

There have been some models of AI introduced in the NHS and showed encouraging results, especially with the reduction of administrative workflow and the analyses of radiological images. Nevertheless, such practices are being individualised to certain hospitals or departments.

Despite the multitude of models of application of AI in healthcare, in general, or maternities, in particular, there has been no unified approach to cover the entire specialty. Furthermore, there is no model of AI

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application that has been suggested to be applied at a national level.

Consequently, introducing AI into maternity care requires strategic leadership to navigate the complexities of implementation successfully. The new practice needs to be at a national level, identical in all Trusts, working simultaneously and without any interpersonal variety in its usage.

This assignment explores the importance of strategic leadership in introducing AI to national maternity services, highlighting key considerations, challenges, and potential benefits.

## **Vision and Mission**

The vision for such strategic plan is “we offer safe maternity with AI”. The mission will be we effective and safe management to all pregnant women everywhere all the time, with the help of AI.

There is also the possibility of using a logo with an acronym, that will reflect the vision and mission: MAIN. That acronym stands for Maternity through Artificial Intelligence Notion.

## **Diagnosis**

It is estimated that 1.3 million healthcare professionals in the NHS are serving one million patients on a daily basis. A significant fraction of the number of patients is consisted of pregnant women. Just in the period of 2021-2022 there have been 578,562 deliveries, with a rise of 3.4% from the previous year. Adding to that, in a more technical view, these numbers reflect only the women who had successful pregnancies. That means, if we consider women who experienced miscarriage, stillbirths, or any type of pregnancy loss, the number of patients is expected to be higher.

Taking into consideration all the antenatal visits, investigations, check-ups, intrapartum care and post-natal management, the input becomes very high. The on-going staff shortages, whether in doctors or midwives, worsens the challenge of keeping up a safe service. Despite the different attempts of the government to replace the shortages and encourage the existing staff to continue with the NHS, the results do not seem fruitful yet. Another important issue is the fact that health professionals spend too much time on bureaucracy. A government review found that health personnel spend 10 hours per week on bureaucracy, while at least a third of this time is unnecessary. It makes sense, that the attention of health caregivers is unnecessarily distracted, with the result of reduced clinical work but more burnout.

In this case, we are facing a situation with:

1. An ongoing increase in the number of patients.

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2. An ongoing reduction in the number of healthcare professionals.
  3. An ongoing increase in the number of bureaucratic assignments.

The introduction of AI into maternity services can reduce the number of healthcare professionals needed and reduce administrative work. As a result, to that, the number of patients will not be affecting the service provision neither quantitatively nor qualitatively.

### **Environmental scan (PESTLE analysis)**

It is important to appreciate the situation and assess what is in the horizon. All the points covered in the introductory part are valid, indeed, but need to be placed in the proper context, before any strategic plan is made.

For this, we can use the PESTLE analysis.

#### **Political**

The safety of maternity services has been an ongoing issue that troubles the government and local authorities in the last few years. The issues are various, and the outcomes have been devastating.

#### **Economic**

Complications in the maternity services have serious financial impact, not only in the health outcomes of mothers and babies, but also in the finances of the government. Many avoidable hospital appointments and admissions, as well as compensations in case of complications, affect the national economy.

#### **Social**

After the several national reports exploring deficiencies in the maternity care, the society has started having doubts in the safety of the NHS, and the care in the maternities in particular.

#### **Technological**

There are too many technological innovations introduced to the maternity services and healthcare in general. Moreover, most Trusts are open and willing to introduce further innovations. However, such innovations are “individual”, at a Trust level. This does not allow a unified system where all employees of the NHS can use it.

#### **Legal**

Adverse outcomes in maternity are followed by legal implications and the associated financial compensations. Prompt identification of health issues and managing patients, will reduce the adverse outcomes and the legal involvement.

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**Environmental**

As much as the NHS has been attempting to “go green” this is far from the reality. Just the maternity notes, blood results, files, and communication, are enough as an example where the environmental component is not addressed adequately. A unified environmental-friendly solution is needed, especially as the preliminary attempts in the healthcare have already proven to be successful.

**The role of AI in Maternity care (Strategic approaches)**

It is important to identify the different aspects where AI can be introduced in the maternity care. To adapt a pragmatic approach and offer a strategy aiming for realistic outcomes, it is necessary, at first, to identify the different aspects of AI that can be introduced to maternity services. In this section the different implementations will be discussed along with their advantages.

The Osborn paradigm (SCAMPER) can be used as an introductory model to describe the principles of the strategy, with more detailed description to follow.

**Substitute**

As a first step, all health records and entries can be substituted to paperless entries. Equally, a lot of the face-to-face appointments can be substituted with virtual meetings. Likewise, communications and alerts.

**Combine**

During the first steps of the transformation, it is possible to combine AI technology with traditional healthcare. This will make the transition smoother and will avoid a “cultural shock” in health personnel as well as in patients.

**Adapt**

Since the pandemic, the healthcare, and the entire world, started adapting to the use of technology. Virtual clinics have been introduced to a lot of hospitals, with positive feedback and outcomes. Having said that, the society is ready for further adaptation.

**Modify**

Maternity healthcare needs to meet the needs of a twenty-first century healthcare. Hence, the maternity facilities need to be modified for a quicker, safer, and more efficient service.

**Put to other uses**

Healthcare professionals need to shift their efforts to different uses, more focused on patient-centred care rather than never-ending bureaucracy. With the universal shift to technology, medical staff can save their

efforts from the paperwork and focus their effort in health provision.

### **Eliminate**

The need to reduce, if not eliminate, paperwork and focus on digital technology is a global goal. Such elimination is necessary – and feasible – in the healthcare.

### **Rearrange**

Once each element from the proposed components reaches a satisfactory finalised form, the process of rearrangement can take place smoothly, as a natural process.

One more important aspect to be considered in the process of rearrangement is the IT personnel and their involvement in maintaining an uninterrupted digital healthcare (discussed in detail in section of "Challenges").

Taking into consideration the above principles in the strategic approach, the following aspects in the maternity services are to be considered. The list can be longer than the proposed one, but as an introductory phase, these are the points to be considered in the beginning, either all at once or one by one.

### **1. Digital transformation**

Currently, Trusts use different digital systems. Such systems contain the results, communications, and plans for every patient. However, due to the variety of systems and their use only in their hospitals, the information is not accessible elsewhere.

A unified system of electronic health record (EHR) used nationally and accessible by health professionals nationwide, will allow safe continuity of care wherever the patients are admitted.

### **2. Patient applications**

As everyone is using smartphones, an introduction of a special app might be helpful. In this application the patients will have their results, information about their appointments, details on the pregnancy progress and any professional communication from clinicians.

The application will be connected to the national systems and updated regularly.

### **3. Virtual clinics**

Fortunately, since the COVID pandemic the use of virtual clinics has been on the rise. However, most clinics

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have their own protocols where clinicians have the full control on how to run it. To introduce a reliable and national style of clinics, agreed protocols are necessary, at a national level. In this way, safety as well as efficiency can be guaranteed.

#### **4. Telemedicine**

Again, this is a technology that is used on individual cases. Blood pressure problems or diabetes are the most common medical issues. However, with clear algorithms the spectrum can be expanded to a bigger range of medical conditions, like recording fetal movements

#### **5. Personalised care plans**

Early detection of pregnancy risks and complications (through AI-powered tools) will allow a more personalised care. This way, short and long-term health plans can be made from the beginning of any pregnancy.

Virtual monitoring (e.g. blood pressure measurements, blood sugar levels etc.) will allow prompt changes in the management of patients without the need to book individual clinic appointments, something that may be delayed due to the load on the health system.

Post-natal monitoring is an important aspect in maternity care. Like with antenatal care, this is something possible to monitor remotely and only patients who do require medical input will need to attend the hospital.

#### **6. Training**

Healthcare professionals undergo a huge amount of training online on top of the face-to-face training sessions. Therefore, online training is not a new aspect, but just an inadequately explored territory. Ensuring the medical staff are trained, online, on every new AI-based healthcare technology is necessary and achievable. In addition to that, digital libraries have already been introduced to all hospitals, where staff members can find policies, guidelines and important documents.

The training could be through online courses or virtual meetings.

Reading material will be available in digital forms (soft copies) making knowledge available and accessible to health personnel.

Digital training has the advantages

- being available all the time.
- it can be completed at our own pace and time.
- can be updated at any time.
- does not require time off work or travelling to attend any course.
- Is environmentally friendly
- Is cost-effective

## **7. Community engagement**

This is achieved either through the application and by the encouragement of patients to participate in the hospitals' pages on social media. This will include introduction and explanation of the innovations, as well as addressing the different queries.

## **8. Research**

With all the data being collected and available in one digital system, it is fairly easy to conduct ethically approved retrospective studies.

This should be an additional point ensuring that the introduction of AI enhances rather than detracts from the human touch in maternity care.

## **Implementation**

The initiation of such a transformation should start through a Pilot programme. Once the pilot programme is established, there should be a phased integration.

From day one there will be continuous auditing of the activities and outcomes with feedback obtained from health personnel and the patients themselves.

As the policies will be based on national standards, members of management will not have to face any dilemmas. Management will only need to ensure that policies are in place and followed as per national guidance.

Auditing is a routine activity in healthcare as it is part of Clinical Governance. Feedback, on the other hand, can be obtained with various methods including the applications.



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## Risks

The digital part of the risk is data privacy and security concerns. These two points, though, are being addressed on a daily basis, as NHS implies policies for such protective measures.

AI-induced errors and their implications in critical care areas is the other risk to be considered. As it is an unexplored territory the plan would be to apply policies for every foreseeable risk and, during the pilot period, ensure there is more involvement of the human factor.

Another risk to be considered is the compliance of the patients. However, such risk is present even without an AI-based healthcare. Through AI technology it is possible to ensure better communication with patients either with regards appointments, reminders, or telecommunication. That means that compliance will always remain a risk, but with AI it is easier to ensure the patients are prompted towards safety.

## Challenges

### Resistance from healthcare professionals

As Peter Drucker stated, “culture eats strategy for breakfast”. An initial wave of resistance is inevitable and expected by traditionalists. On the positive side, since the pandemic people became more acceptable of the involvement of technology in our day-to-day activities, including healthcare. Most healthcare professionals seem open to innovations that do actually help. A proper introduction and user-friendly innovation would face less resistance from healthcare professionals. To put it clearly, once more, if the system is user-friendly and healthcare professionals can train properly and seek help with troubleshooting, resistance will be eliminated. It is expected, though, that members of staff with fanatical conservative ideas may resist, if not sabotage, the innovation. In this case the approach to defying such opposition will count on two main aspects: the emotional and the disciplinary.

The emotional factor could be more challenging to control. If none of the advantages mentioned earlier with AI transformation manage to soften the position of a strict traditionalist, then it is unlikely there will be any further sensible reason to convince them to change their mind. They are expected to exist, but as a minute minority. As a result, the only way for the AI service to proceed without the danger of disruption, is by making it compulsory and regulated.

Here comes the disciplinary aspect. That relates to the rules and regulations associated with AI innovation. In a simple example: if certain practice is approved and implemented by the health authorities, then not adhering to it would lead to punitive consequences.

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### **Resistance and apprehension from patients**

The public perceptions of the NHS and social care have been in a persistent downfall. The situation has reached a stage where the public who believe the NHS is providing a satisfactory service has been 44%, while in 2017 it was 57%, and one year prior to that 66%! The figures approach those of the Northern American where 70% feel failed by the health care system.

Therefore, it is expected to face resistance from the public either in the following forms:

- Challenge in accepting AI innovation.
- Challenge in believing in AI innovation.
- Challenge in engaging in AI innovation.

This impediment is multifactorial and pluridimensional. Reasons behind such challenges could relate to the educational level of the patients, cultural backgrounds, socioeconomic statuses, previous experiences, and every possible variable that can influence, or cloud, their decisions.

The best way to overcome this challenge is by communication and positive publicity. This should include leaflets and posters in public places, and videos and posts on social media. Smart publicity is essential. One example is by using the MAIN acronym (Maternity through Artificial Intelligence Notion) in posters is per our vision and mission, but also use it by changing the words, to make it more emotional, like: Mothers AI Neonates or Modernity AI Notion.

The strategic aim here is to engage with the popular masses resourcefully and smartly, resulting in an agreement to move - or even give a chance - to modernisation.

Gustave Le Bon, in his book "The Crowd: A Study of the Popular Mind", in 1895, wrote that in a state of collective mind the individuality is weakened. This results in the personalities becoming submissive, more gullible, and with infectious responses and actions. This phenomenon has been - and is still being - abused by different authorities in controlling the people. However, in our strategic plan, the aim is to use this phenomenon for positive management, rather than trying to take advantage of the patients.

### **High initial investment costs**

Introducing a unified healthcare innovation and patient application are the main aspects that would require most of the funding. Overcoming the financial aspects is described in the "Stakeholders" point (*vide infra*). Nevertheless, as the changes are introduced through a pilot scheme, this would:

- a. Require less investment costs, not comparable to a nationwide project.
- b. Once the results from the pilot confirm positive outcomes, this will encourage expansion of the transformation.
- c. The stepwise addressment of difficulties and on-the-spot correction of any issues would create a snowball effect allowing the investments to increase and the transformation to expand.

### **Ensuring equal access**

Even though we live in the age of technology, it is expected to have patients who do not have smartphones, access to daily internet, or even acquaintance with modern technology. However, the AI does not aim to substitute completely and instantly the ongoing system. Through the different phases of its introduction, and through the auditing, feedback, and research, it is possible to assess the magnitude of the challenge (of unequal access) and in a forthcoming phase address it accordingly.

### **Human factors and human errors**

Human errors are inevitable in any profession. However, when it comes to the safety of patients the results can be catastrophic. The issue with human factors has never been able to be eliminated completely, especially in healthcare. It is not clear how this particular factor can affect the efficiency of the transformation. However, the aim of AI-based services is to reduce the human errors. Clinicians will be less distracted by bureaucracy and trails of paperwork. This will allow health professionals to be more focused in the provision of medical care to their patients. So, the expected result is a reduction of the human errors.

### **IT personnel**

One of the challenges health professionals face on a day-to-day basis is their ability to communicate with IT personnel promptly and address any queries efficiently in minimal time. With the service shifting to an AI-based culture, each hospital need to have available IT personnel to assist healthcare professionals 24/7 in case of troubleshooting. This might be one of the biggest changes in the activities of IT departments.

### **Stakeholders and their engagement**

The aim will be to approach the strategy in a multidisciplinary mode simultaneously. Such approach has the advantages of:

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- I. Reducing the financial burden from one individual source.
  - II. Encouraging the other stakeholders to participate, once one of them is already a participant.
  - III. A multidisciplinary monitoring body, that would assess more objectively the outcomes.

The three main stakeholders that are required in this plan are:

- a. NHS England
- b. The Royal College of Obstetricians and Gynaecologists (RCOG)
- c. The individual Trusts
- d. Individual donors

NHS England, and the Government in general, faces the challenge of having to spend a considerable amount of their budget in the introduction on new policies for the maternities, but also in dealing with the different impediments (e.g. the Oakenden proposal for £200m-£350m to be spent on maternity). Understandably, without a clear strategy, it is impossible to convince the government to invest in a new proposal without any guarantees. However, from the aforementioned advantages of the AI-healthcare and with all the safety measures proposed, it is more likely to obtain the necessary budget. The results from the pilot phase would be the part of focus. Once the pilot phase proves that the maternity services can become safer, more efficient, cost-effective and with positive feedbacks, that will show that the objectives can be met in a realistic manner. So, their involvement should cover mainly the funding and monitoring part of the project.

With regards to the RCOG, it is important to take into consideration that apart from the necessity of their involvement, the college is a registered charity. In other words, the RCOG will always have financial privileges when involved in any investment in the healthcare. As the RCOG consists of healthcare members directly involved in the maternity care, they can participate in the funding component, as well as the designs of the apps and software. The RCOG is to approve the quality of the new AI methods introduced to the system and ensure the policies are implemented the same way the national guidelines are.

Every Trust will have to participate to the financial burden, depending on the size of the activity of their maternity services. In other words, their financial participation should be proportional to their activity. This will ensure more collaboration from the hospitals. Beyond that, each Trust needs to ensure that the national policies are followed, and participate in the auditing, feedback and monitoring process.

Donations from Individual donors is one more option, to be considered. However, it is not an option to count

on, especially in the first phases. Even though such donations might not be substantial, or comprising, the main financial core of the project, it is possible for the donations to increase once the transformation is in practice and shows successful results.

In conclusion, as it is obvious, every stakeholder gets to play a role in the involvement, whether directly or indirectly, with direct collaboration and the necessary empowerment.

### **Evaluation of the AI-service**

The process of evaluation should be a live and on-going procedure from day one. Issues need to be addressed promptly, seriously, and with full transparency.

- **Track patient satisfaction scores.**

A serious analysis of the feedback from patients is pivotal in improving the healthcare system. Areas of concern should be addressed earnestly, without any attempts to undermine the concerns.

- **Monitor the rate of complications and strive for continuous reduction.**

Patient safety is the most important point to be monitored during the provision of management in healthcare. Any issue that rises need to be escalated and a root-cause analysis to be applied, so that such complication is not repeated.

- **Evaluate mental well-being through regular surveys and feedback.**

Any innovation can be stressful. It is necessary to obtain feedback from health personnel on a regular basis. Every feedback is to be taken seriously with the aim to address the proposed challenge.

- **Measurement the successful implementation rate of new technologies and practices.**

The results from the monitoring process of the AI-based services have to be audited, assessed, and shared with health personnel. Feedback on the results, from health professionals, will help in the fine-tuning of the AI services.

- **Research**

Research is not to be used only for health topics. With all the data that will be available from patients' appointments, feedbacks, complications etc. statistical analyses will be conducted. The results not only will allow to highlight (statistically) significant issues, but to address them quickly. Any evaluation of the service that is based on research should be reliable enough to be considered. Even positive findings are necessary to be shared, outside the health system, with publications, conference presentations, etc. In such way, there is an opportunity for a wider range of feedback and better innovation.

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## Conclusion

AI-based maternity care is an inevitable transformation in healthcare. There are already several aspects of such technology utilized in different maternities, nationwide, while the results have been positive. The NHS, in general, and the maternity services, nationwide, are going through a lot of pressures. The need to rearrange the maternity care has become a necessity and the introduction of AI-services are inevitable. There are many challenges to be faced, but as the world is moving towards innovation, a sophisticated strategy can accelerate this transformation, safely and efficiently.



Medtronic