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Artificial Intelligence in Prenatal Screening: Implications for OBG Nursing

Ms. Smitha Sivan¹, Ms. Krinal Chauhan²

^{1,2}Lecturer, M.Sc. Nursing (OBGYNC), PPSON, PPSU, Surat.

Abstract:

Artificial Intelligence (AI) is revolutionizing the healthcare landscape, including obstetrics and gynecological (OBG) nursing. This article explores the integration of AI in prenatal screening and its implications for nursing practice. AI technologies such as clinical decision support systems, machine learning algorithms, mobile health applications, and robotics are increasingly used to enhance diagnosis, monitoring, and treatment of maternal and fetal health conditions. From fetal heart rate monitoring and cardiotocography interpretation to the prediction of gestational diabetes, preeclampsia, and preterm labor, AI offers improved accuracy, timely interventions, and consistent decision-making. AI also supports nurses in data analysis, enhances workflow efficiency, and reduces human error. While AI cannot replace nurses, it serves as a powerful tool to complement nursing care, enabling better outcomes in maternal health. As AI continues to evolve, its role in prenatal and postnatal care promises a transformative shift in OBG nursing practice.

Keywords: Artificial Intelligence, Prenatal Screening, OBG Nursing, Maternal Health, Clinical Decision Support

Introduction

Health care system plays a major role in day to day life. Health care has improved rapidly with more structural, transformational and revolutionary changes with Artificial intelligence. AI will play significant role in assisting the health care team such as doctors, nurses and other health care team members by delivering more efficient patient care and quality patient outcome. Nurses are an integral part of the healthcare team who collaborates doctors, other health care personnel to provide comprehensive patient care. It is essential for Nurses to have a basic understanding of AI concepts, since AI is utilized in optimize patient care, ensure efficient use of limited resources and improve health-economic models.

In nursing practice, clinical information was very vast, complex, constantly changing and requires a refined skill set for practical application during patient care. So high-quality nursing care was required for instantaneous processing and decisive action when interacting with abundant clinical data. Therefore the continual demand for real-time analysis, consumption and action against volumes of clinical information has become a new standard in nursing care with artificial intelligence (AI), which offers a promising quality nursing care transformation. AI is known as neural networks because of the way it is structured, which is comparable to how neurons are placed in the brain with their many neural nodes.

Artificial intelligence (AI) is growing exponentially in obstetrics and gynecological nursing fields also. In obstetrics and gynecological nursing, AI tool include clinical decision support, mobile health and sensor based technologies, voice assistants and robotics was used to interpret fetal heart rate (FHR) and



cardiotocography (CTG) to aid in the detection of preterm labor, pregnancy complications, in vitro fertilization, gynecological surgery, screening of cervical and ovarian cancers, screening for gestational diabetes mellitus and review discrepancies in its interpretation between nurses to reduce maternal and infant morbidity and mortality

In order to help with illness prevention, diagnosis, and patient monitoring, this sophisticated algorithm AI software is currently used in medicine to evaluate vast volumes of data. All things considered, AI can support practitioners in their decision-making and will enable physicians to make more confident choices.

AI in Women's Health

- Early Detection and Diagnosis
- Personalized Treatment Plans
- Enhanced Pregnancy Monitoring
- Improving Ultrasound Accuracy
- Predictive Analytics for Complications
- Tele health and Accessibility
- Prediction and screening of Cancer
- In vitro fertilization

Application of AI in Obstetrics

- Fetal Heart Rate Monitoring and Pregnancy Surveillance
- Prediction of Gestational Diabetes Mellitus
- Prediction of Preterm Labour & Miscarriage
- Prediction of Preeclampsia
- Parturition
- Prediction of Post partum depression

Focus Areas On Role of AI In Complimenting Maternal Health.

- Fetal Heart Monitoring And Pregnancy Surveillance
- Cardiotocography (CTG) was an early development in the field of obstetrics. CTG is the most important device for evaluating fetal well-being through measurements of the fetal heart rate and uterine contractions.
- Despite its clinical importance, it is difficult to ensure objectivity between interpretations, and above all, regular observations are necessary in order to avoid a long gap between detection of suspicious patterns and intervention.
- AI has been used to CTG interpretation utilizing contemporary computer systems in order to overcome the limits in human interpretation, and several trials are now under progress. Human constraints including weariness, attention, prejudice, poor communication, cognitive overload, and fear of hurting someone don't affect AI systems.
- AI can give a qualitative and quantitative overview of Baseline FHR Variability, Acceleration, Deceleration, Uterine contraction intensity, and –FHR pattern changes It helps to monitor the FHR rate during labor via analysing cardiotocographs and estimating possible outcomes.



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- Why By using this technique, the disparities in how various obstetricians perceive intrapartum monitoring would be reduced. Obtain more consistent and repeatable results for every analysis. ultimately lower maternal and neonatal morbidity and complications. The development of an effective method to monitor FHR will enhance treatment and reduce unfavorable outcomes, as perinatal asphyxia is a major global issue.
- The AI system was able to identify mistakes and read the data at a level comparable to that of the subject matter experts. The capacity of AI interpretation of CTG during labor to help practitioners determine the optimum care on an individual basis is now being assessed in this major experiment.

WHAT IS NEXT IN FETAL MONITORING?

- Technical development and research of in-home pregnancy surveillance continue with these priorities: Short term variability analysis using pattern recognition of the Doppler signal. AI interpretation of FHR variability and syndrome decoding. AI generation of warnings and alerts addressed to the patient and/or family. Messaging and real time communication to the attending physician and consultants. AI generation of alarms addressed to relatives and obstetric brigade or ambulance.
- Gestational Diabetes Mellitus Polak and Mendyk created a study to evaluate the use of an AI calculator to screen for GDM that would be more cost-efficient and less inconvenient for the patient than current guidelines.
- It is an online calculator that a physician and patient can use for screening. The calculator uses risk factors, such as High blood pressure, Hyperlipidemia, Smoking, Weight, Low-fat diet, and Ethnicity. Despite the AI having lower-efficacy than the standard screening test at present, the current ANN model on the website will continue to progress and learn as it continues to be exposed to more cases, with the finality of eventually helping to lower health costs.

Preterm Labor in AI:

In a recent study in the journal <u>Scientific Reports</u>, researchers evaluated the accuracy, precision, and F1score of several machine learning (ML) models in predicting the likelihood of preterm births in 50 pregnant women. Despite several attempts at unraveling the underlying causes of preterm birth, the multifaceted nature of the condition has made identifying a biological cue for preterm births hitherto impossible.

Given its status as a significant health concern and its strong correlation to adverse neonatal outcomes (mortality and morbidity), this study aims to use ML models to predict preterm risk, thereby allowing for timely interventions in high-risk women. Machine learning, particularly deep learning, achieved good to excellent prediction of perinatal outcome in asymptomatic pregnant women with short cervical length in the second trimester. Currently, the short cervical length is one of the strongest risk factor for prematurity. Accuracy of 97% in predicting preterm labor.

Singh et al. studied the combination of AI and amniotic fluid (AF) proteomics and metabolomics, in conjunction or independently with imaging, demographic, and clinical factors, to predict perinatal outcomes in asymptomatic women with short cervix length.

A study done by Idowu et al. 2018 emphasized the importance of using AI technology to decrease expenses generated by inaccurate detection of preterm labor leading to unnecessary hospitalizations and procedures, and in the meantime, expedite treatment in those who are in true labor to prevent hazardous consequences for the baby and the mother. • In this study, they used electro-hysterography (EHG) signals and used three



distinct machine learning algorithms to classify these signals to help them identify true labor and accurately diagnose preterm labor.

The Future of Prenatal Care:

Beyond the Nine Months While the current focus of PregnoTech and GeneMama is predominantly on the nine months of pregnancy, the potential of AI in maternal care stretches far beyond that. Imagine a world where AI continues to guide new mothers through the postnatal phase, offering insights on breastfeeding, baby sleep patterns, and even early childhood development. With the surge of AI in healthcare, prenatal care is undergoing a paradigm shift. Instead of one-size-fits-all advice, AI algorithms sift through individual health data, genetic information, and even lifestyle habits to offer bespoke prenatal care recommendations.

Conclusion

The innovation of artificial intelligence in the healthcare system provides a better future in obstetrics and gynecological nursing field. AI technology help nurses to have a better data-driven decision, increase disease diagnosis efficiency, monitoring and caring the patients efficiently and accurately, integrate information, reduce unnecessary hospital visits and create time-saving administrative duties. AI is a decision engine that can exponentially increase the effectiveness and efficiencies of nursing care delivery system. AI cannot replace Nurses in obstetrical and gynecological area, but nurses can create wonders through AI.

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