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Artificial Intelligence in Improving Adverse Pregnancy Outcomes – A Scoping Review and Ethical Issues

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ADMINISTRATIVE INFORMATION

Support - Without financial support.

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Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 12 February 2025 and was last updated on 12 February 2025.

INTRODUCTION

Review question / Objective According to PICO framework: (P) participants—pregnant women; (I) investigated condition—use of artificial intelligence; (C) comparison—no AI use; (O) outcome—improving adverse pregnancy outcomes(APOs).
The aim is to find out how AI can improve the main adverse pregnancy outcomes (APOs) including hypertensive disorders of pregnancy (gestational hypertension, preeclampsia and related disorders), gestational diabetes, preterm birth, fetal growth restriction, low birthweight, small for gestational age newborn, placental abruption and stillbirth and how its use can prevent fatal outcomes and poor prognosis. Ethical issues are also considered, such as clinical decision making with the use of AI, as well as autonomy and informed consent.

Background Although AI is developing rapidly, its use in adverse results in pregnancy (then) is still very small. The aim of this study is to understand how it is already possible to improve it and how the course of pregnancy can change. Systems that work in adverse pregnancy results optimize labor management and increase fetal surveillance. These solutions also help reduce social inequalities and it is also important to discuss associated ethical issues such as autonomy and consent, reproducibility and accuracy of results.

Rationale Adverse pregnancy outcomes (APO), which include hypertensive disorders of pregnancy (gestational hypertension, preeclampsia and related disorders), gestational diabetes, preterm birth, fetal growth restriction, low birthweight, small for gestational age newborn, placental abruption and stillbirth are health risks for pregnant women that can have a fatal outcome. The aim is to investigate the usefulness of AI in improving these outcomes. Other cases where health results are improved include, for example, pediatric critical care, the identification of diseases more accurately, such as diabetic retinopathy. AI can be used for

the diagnosis, personalized treatment and predict patient survival rates.

METHODS

Strategy of data synthesis The PRISMA-ScR guidelines will be adopted for this review to standardize reporting (Tricco et al., 2018). The following electronic databases will be searched: PubMed, Scopus and Web of Science. This scoping review will include peer-reviewed articles across any study design. However, systematic reviews, meta-analyses, unpublished studies, and grey literature sources (e.g., reports and conference abstracts) will be excluded. The focus on peer-reviewed literature enhances the consistency in reporting, which in turn boosts the reliability and comparability of the information gathered (Snedeker et al., 2010). This scoping review will consider studies published between 2020 and 2024.

Eligibility criteria Studies that exploit AI's ability to improve at least one of the following adverse pregnancy outcomes (APOs) in pregnant women including hypertensive disorders of pregnancy (gestational hypertension, pre-eclampsia and related disorders), gestational diabetes, preterm birth, fetal growth restriction, low birthweight, small for gestational age newborn, placental abruption and stillbirth.
Exclusion criteria: non-original studies including reviews, commentaries, editorials, letters, case reports, conference proceedings, books, original studies without accurate and clear data on research variables and duplicated data.

Source of evidence screening and selection All studies identified through the computerized search of the databases will be imported into Rayyan, a web-based tool designed specifically for systematic, scoping, and narrative reviews. Following the established inclusion criteria, two independent researchers will screen the studies to ensure that only articles meeting these criteria are selected. A study's inclusion requires agreement between the two reviewers. Any discrepancies will be resolved through discussion or by consulting a third reviewer.
The selection process will involve eliminating duplicate articles and will be conducted in three stages: the first stage examines the article titles, the second stage reviews the abstracts, and the final stage consists of reading the articles in their entirety. The results of the search and the study inclusion process will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping reviews (PRISMA-SCR) flow diagram (Tricco et al. 2018).

Data management For the selection process, the Rayyan platform (https://rayyan.ai/) will be used, a widely recognized tool in the scientific community for reviewing and selecting studies in reviews. Selected reviewed independently by two reviewers, and any discrepancies will be discussed with a third reviewer until an agreement is reached. To extract data evidence, we will do a table that will perform a general characterization of the selected studies, reporting information such as the authors, year of publication, country of origin, study aims, methods, participants and sample size, study design, type of analysis, and key findings relevant to the review questions.

Reporting results / Analysis of the evidence The presentation of results will be incorporated into a comprehensive scoping review report, which will include a table summarizing the characteristics of included studies, along with other items. A narrative synthesis approach will be employed to explore the range of concepts and provide an understanding of the current literature.

Presentation of the results The findings of the study will be present according to the PRISMA -ScR checklist. A PRISMA flow chart will be used to present the methodological process in detail and the results will be presented in narrative form, accompanied by tables and figures.

Language restriction Only studies in English will be included.

Country(ies) involved Portugal.

Keywords Artificial intelligence, perinatal care, pregnancy outcome, ethics.

Dissemination plans The findings of this scoping review will be disseminated through multiple channels to ensure that the findings reach a broad audience. The primary dissemination strategy will involve submitting the manuscript to a peer-reviewed scientific journal. In addition to publication, the findings will be presented at national and international conferences and seminars.

Contributions of each author
Author 1 - Mariana Nogueira - Conceptualization and study design (objectives, research questions, and inclusion and exclusion criteria). Drafting the study protocol. Search and selection of studies (reviewer 1: by title and abstract, and full text).

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Author 2 - Sandra Lopes Aparício - Provides guidance and expertise in study design and methodology. Review of protocol manuscript. Assists in developing a comprehensive search strategy. Search and selection of studies (reviewer 2: by title and abstract, and full text). Supervision.
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Author 3 - Ivone Duarte - Collaborates with first and second authors on study selection, resolving discrepancies through discussion. Review the protocol manuscript and provide expertise in ethics and bioethics. Supervision. Consultation on revision and finalization. Conducts the final review of the manuscript.
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Author 4 - Margarida Silvestre - Collaborates with first and second authors on study selection, resolving discrepancies through discussion. Review the protocol manuscript and provide expertise in adverse pregnancy. Supervision. Consultation on revision and finalization. Conducts the final review of the manuscript.
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