

ESHRE guideline: ovarian stimulation for IVF/ICSI: an update in 2025[†]

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ABSTRACT

STUDY QUESTION: What is the recommended management of ovarian stimulation, based on the best available evidence in the literature?

SUMMARY ANSWER: This updated ESHRE guideline on ovarian stimulation for IVF/ICSI provides 121 recommendations, answering 21 key questions on ovarian stimulation for IVF/ICSI.

WHAT IS KNOWN ALREADY?: Before the ESHRE guideline on ovarian stimulation for IVF/ICSI was published in 2019, ovarian stimulation for IVF/ICSI had only been discussed briefly in the National Institute for Health and Care Excellence guideline on fertility problems and in a statement by the Royal Australian and New Zealand College of Obstetricians and Gynaecologists.

STUDY DESIGN, SIZE, DURATION: The guideline was developed according to the structured methodology for ESHRE guidelines. The 18 key questions from the 2019 version of the guideline were revised by the Guideline Development Group (GDG). This resulted in the addition of one new key question, the splitting of the key question on fertility preservation in three separate key questions (fertility preservation for women facing gonadotoxic treatment, elective oocyte cryopreservation, and oocyte donation) and several new interventions being added to the existing key questions. Papers published between 31 October 2018 and 2 February 2025 and written in English were included. The critical outcomes for this guideline were efficacy in terms of cumulative live birth rate per started cycle or live birth rate per started cycle, as well as safety in terms of the rate of occurrence of moderate and/or severe ovarian hyperstimulation syndrome (OHSS).

PARTICIPANTS/MATERIALS, SETTING, METHODS: Based on the available evidence, recommendations were formulated and discussed until consensus was reached within the GDG. Following stakeholder review of the initial draft, the final version was approved by the GDG and ultimately by the ESHRE Executive Committee.

MAIN RESULTS AND THE ROLE OF CHANCE: The guideline provides a total of 121 recommendations: 42 recommendations remained unchanged in 2019, 4 recommendations were reworded for better understanding, 29 recommendations were updated in view of new evidence, and 46 new recommendations for 2025 have been formulated. The guideline provides 4 recommendations on pre-stimulation evaluation, 7 recommendations on pre-treatment therapies, 50 recommendations on pituitary suppression and

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ovarian stimulation, 17 recommendations on monitoring, 18 recommendations on triggering of final oocyte maturation and luteal support, and 8 recommendations on the prevention of OHSS. In addition, the guideline provides 17 recommendations on fertility preservation, both oncologic and elective, and oocyte donation. These include 90 evidence-based recommendations, of which only 42 were formulated as strong recommendations and 48 as conditional, as well as 29 good practice points and 2 research-only recommendations. Of the evidence-based recommendations, none were supported by high-quality evidence, 6 by moderate-quality evidence, 36 by low-quality evidence, and 148 by very low-quality evidence. To support future research on ovarian stimulation for IVF/ICSI, a list of research recommendations was provided.

LIMITATIONS, REASONS FOR CAUTION: Several newer interventions are not well studied yet. For most of these interventions, a recommendation against the intervention or a research-only recommendation was formulated based on insufficient evidence. Future studies may require these recommendations to be revised.

WIDER IMPLICATIONS OF THE FINDINGS: The guideline provides clinicians with clear advice on best practice in ovarian stimulation, based on the best evidence available. In addition, a list of research recommendations is provided to promote further studies in ovarian stimulation.

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DISCLAIMER: This guideline represents the views of ESHRE, which were achieved after careful consideration of the scientific evidence available at the time of preparation. In the absence of scientific evidence on certain aspects, a consensus between the relevant ESHRE stakeholders has been obtained.

Adherence to these clinical practice guidelines does not guarantee a successful or specific outcome, nor does it establish a standard of care. Clinical practice guidelines do not replace the need for application of clinical judgment to each individual presentation, nor variations based on locality and facility type.

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Introduction

Ovarian stimulation (OS) is defined as pharmacological treatment with the intention of inducing the development of a few, several, or many ovarian follicles. It can be used (i) for timed intercourse or insemination and (ii) in assisted reproduction, to obtain multiple oocytes at follicular aspiration (Zegers-Hochschild *et al.*, 2017).

OS for IVF/ICSI has not been addressed by existing evidence-based guidelines. It is discussed briefly in the National Institute for Health and Care Excellence guideline on fertility problems

and the Royal Australian and New Zealand Colleges of Obstetricians and Gynaecologists have published a statement on OS in assisted reproduction. Based on the lack of guidelines, the ESHRE Special Interest Group Reproductive Endocrinology initiated the development of an ESHRE guideline focusing on all aspects of OS for IVF/ICSI.

In 2019, ESHRE published a guideline on OS for IVF/ICSI, aiming to provide clinicians with evidence-based information on the different options for OS for IVF/ICSI, taking into account issues such as the 'optimal' ovarian response, live birth rates (LBR),

safety, patient compliance, and individualization. In this new guideline, special attention has also been given to pre- and adjuvant treatments in LOW responders and the prevention of ovarian hyperstimulation syndrome (OHSS) in HIGH responders.

The current guideline is an update of the version from 2019, with amendments to the recommendations based on recently published data. Where amendments were made, this is labelled as such [updated]. If the GDG felt rewording of a recommendation was necessary without new evidence on the topic, this was also indicated [reworded].

Materials and methods

The guideline was developed according to a well-documented methodology that is universal to ESHRE guidelines (Vermeulen et al., 2020).

In the terminology part, it was decided to replace the term POOR response by LOW response in order to refrain from making any suggestion on prognosis or safety for this specific group.

In short, the 18 key questions from the 2019 version of the guideline were revised by the Guideline Development Group (GDG). This resulted in the addition of one new key question, the splitting of the key question on fertility preservation into three separate key questions (fertility preservation for women facing gonadotoxic treatment, elective oocyte cryopreservation and oocyte donation), and several new interventions being added to the existing key questions. The final guideline was built from a list of 21 key questions, all answered with systematic reviews as PICO (Patient, Intervention, Comparison, Outcome) questions. For each PICO question, databases (PUBMED/MEDLINE and the Cochrane library) were searched from the date of the last searches of the 2019 version of the guideline (31 October 2018) up to 2 February 2025, with the limitation of studies written in English. From the literature searches, studies were selected based on the PICO questions, assessed for quality, and summarized in evidence tables and summary of findings tables. The critical outcomes for this guideline are efficacy in terms of cumulative live birth rate (CLBR) per started cycle and LBR per started cycle, as well as safety in terms of moderate

and/or severe OHSS. GDG meetings were organized (primarily on-line) where the evidence and draft recommendations were presented by the assigned GDG member and discussed until consensus was reached within the group.

Each recommendation was labelled as strong or conditional, and a grade was assigned (Andrews et al., 2013) based on the strength of the supporting evidence (high ⊕⊕⊕⊕, moderate ⊕⊕⊕○, low ⊕⊕○○, and very low ⊕○○○). In the absence of evidence, the GDG formulated no recommendation or a good practice point (GPP) based on clinical expertise.

Strong recommendations suggest that the recommended option applies in most circumstances, whereas conditional recommendations are dependent on specific factors, which need to be considered with benefits/risks weighed before applying a given option (Fig. 1).

The guideline draft and an invitation to participate in the stakeholder review were published on the ESHRE website between 5 May 2025 and 16 June 2025. In addition, all relevant stakeholders received a personal invitation to review by e-mail. We received 486 comments from 156 reviewers. All comments were processed by the GDG, either by adapting the content of the guideline and/or by replying to the reviewer. The review process was summarized in the review report, which is published on the ESHRE website (www.eshre.eu/guidelines).

This guideline will be considered for update four years after publication, with an intermediate assessment of the need for updating two years after publication.

Results

Key questions and recommendations

The current document summarizes all the key questions and the recommendations from the 2025 update of the ESHRE guideline on 'ovarian stimulation for IVF/ICSI'. Further background information and the supporting evidence for each recommendation can be found in the full version of the guideline available at www.eshre.eu/OSguideline. For easy reference, the recommendations have been summarized in schematic overviews (Figs 2 and 3).

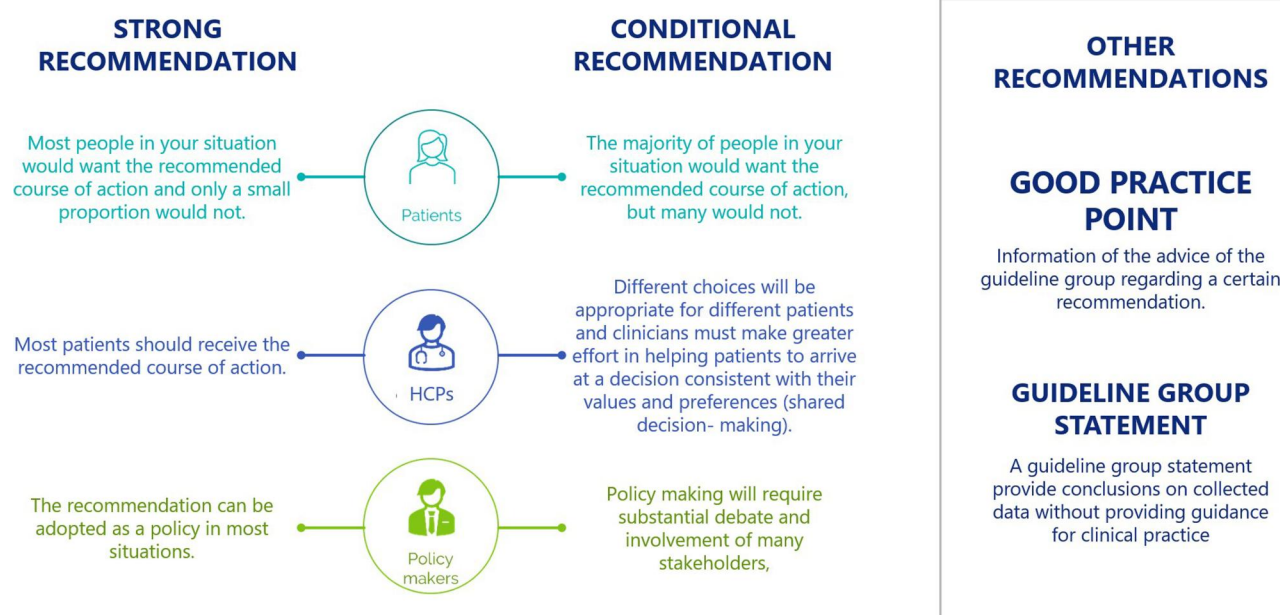


Figure 1. Suggested interpretation of the strong and conditional recommendations included in the guideline by patients, health care professionals (HCPs) and health care policy makers.

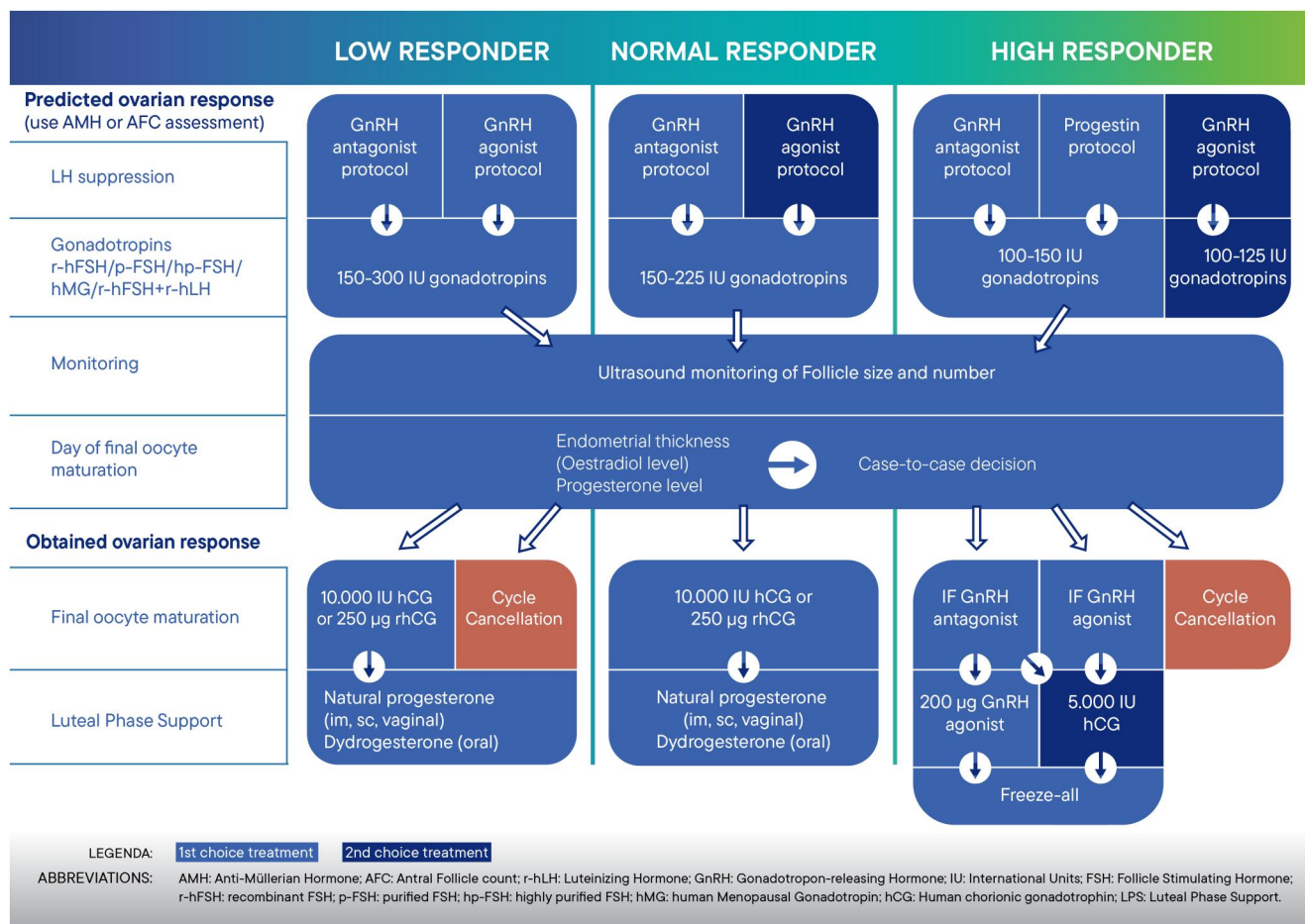


Figure 2. Schematic overview of recommendations from the guideline ‘Ovarian stimulation for IVF/ICSI’ for high, normal, and low responders.

AMH: anti-Müllerian hormone; AFC: antral follicle count; r-hLH: luteinizing hormone; GnRH: gonadotropin-releasing hormone; IU: international units; FSH: follicle-stimulating hormone; r-hFSH: recombinant FSH; p-FSH: purified FSH; hp-FSH: highly purified FSH; hMG: human menopausal gonadotropin; hCG: human chorionic gonadotropin; LPS: luteal phase support.

Pre-stimulation evaluation

Is the assessment of the predicted response to ovarian stimulation sufficiently reliable?

For predicting high and low response to ovarian stimulation, the use of either antral follicle count (AFC) or anti-Müllerian hormone (AMH) is recommended. [updated] (Liu et al., 2023b)

Strong
⊕○○○

Age, BMI, basal FSH, inhibin B, basal oestradiol, basal progesterone, and basal LH are not recommended for the prediction of ovarian response. [2025] (Broekmans et al., 2006; Broer et al., 2013a,b)

Strong
⊕○○○

What is the prognostic value of hormonal assessment at baseline?

AFC, AMH, basal FSH, basal LH, basal oestradiol, basal progesterone, and inhibin B are not recommended for the prediction of pregnancy and live birth. [updated] (Broekmans et al., 2006; Doody et al., 2010; Broer et al., 2013b; Sun et al., 2018; Wang et al., 2022; Liu and Wang, 2023; Lim et al., 2024; Zhang et al., 2024)

Strong
⊕○○○

Female age and BMI are predictors of pregnancy and live birth. [2025] (Broer et al., 2013b)

Strong
⊕○○○

Pre-treatment therapies

Does hormone pre-treatment improve efficacy and safety of ovarian stimulation?

Pre-treatment with oestrogen before ovarian stimulation using the GnRH antagonist protocol is not recommended for improving efficacy. [updated] (Zhu et al., 2022)

Strong
⊕○○○

Pre-treatment with progesterone before ovarian stimulation is probably not recommended for improving efficacy. [reworded] (Farquhar et al., 2017)

Conditional
⊕○○○

Oestrogen or progesterone pre-treatment can be used for scheduling purposes, given the data on efficacy and safety. [reworded]

GPP

Combined oral contraceptive pill (COCP) pre-treatment is not recommended in the GnRH antagonist protocol with FSH alone stimulation, because of reduced efficacy. [updated] (Farquhar et al., 2017)

Strong
⊕○○○

A minimal washout period of 5 days may be applied if COCP is used for programming cycle in the case of a fresh transfer. [2025]

GPP

GnRH antagonist pre-treatment before ovarian stimulation in a delayed-start gonadotropin protocol is probably not recommended. [2019] (Blockeel et al., 2011a, Eftekhari et al., 2018; Zhang et al., 2021)

Conditional
⊕○○○

hCG pre-treatment can only be used in the context of a clinical trial. [2025] (Beretsos et al., 2009)

Research only

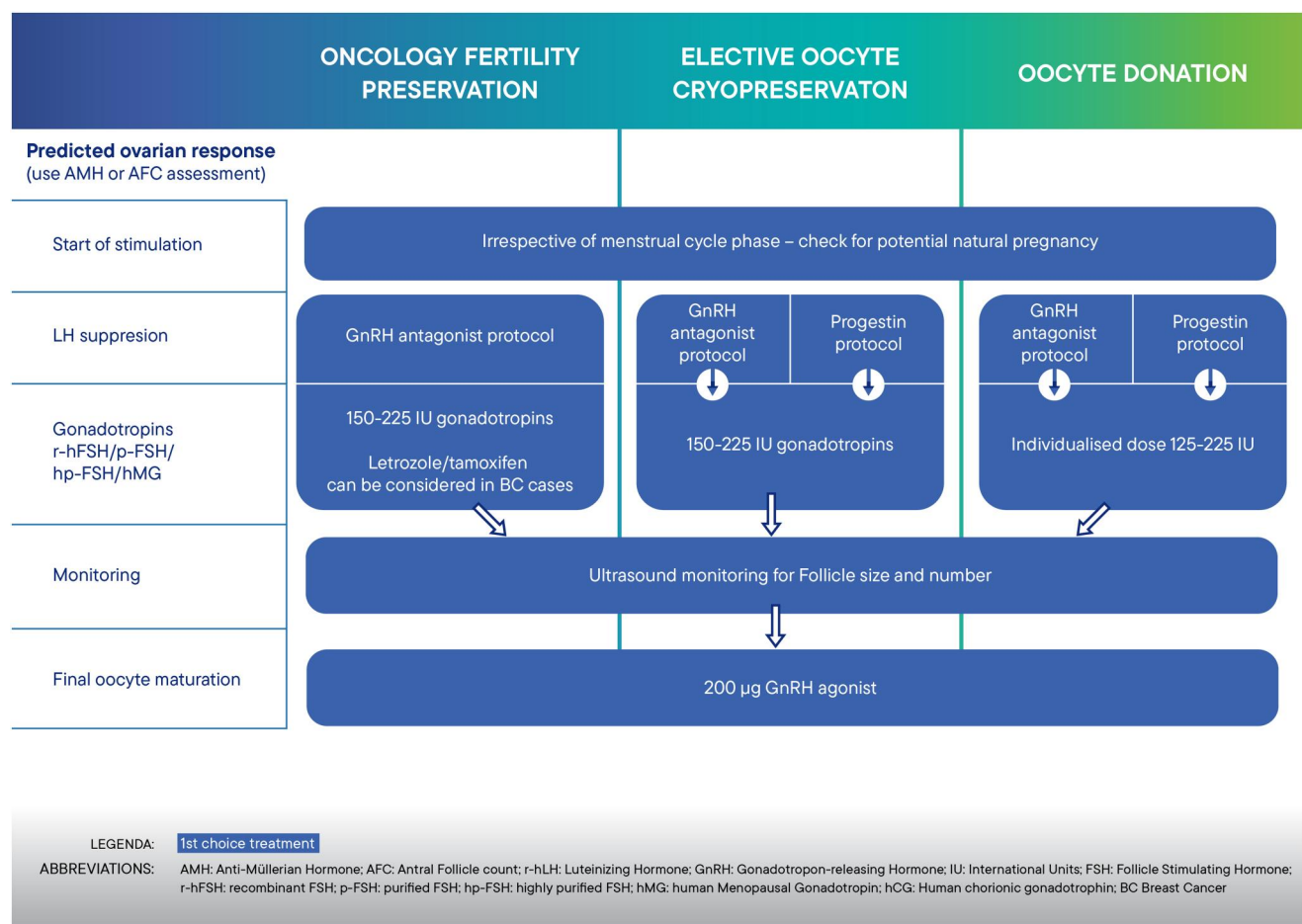


Figure 3. Schematic overview of recommendations from the guideline ‘Ovarian stimulation for IVF/ICSI’ for fertility preservation in women facing gonadotoxic therapies, elective cryopreservation, and oocyte donation. AMH: anti-Müllerian hormone; AFC: antral follicle count; r-hLH: luteinizing hormone; GnRH: gonadotropin-releasing hormone; IU: international units; FSH: follicle-stimulating hormone; r-hFSH: recombinant FSH; p-FSH: purified FSH; hp-FSH: highly purified FSH; hMG: human menopausal gonadotropin; hCG: human chorionic gonadotropin; BC: breast cancer.

Pituitary suppression and ovarian stimulation

According to predicted response-based stratification, which stimulation protocol is most efficient and safe?

High responder

Delayed-start ovarian stimulation is probably not recommended routinely in predicted high responders to decrease the risk of OHSS. [2025] (Casano et al., 2012; Revelli et al., 2020)	Conditional ⊕○○○
A reduced gonadotropin dose (100 to <150 IU) is probably recommended to decrease the risk of OHSS in predicted high responders. [2025] (Arce et al., 2014; Oudshoorn et al., 2017; Ishihara et al., 2021)	Conditional ⊕○○○
The GnRH antagonist protocol is recommended for predicted high responders. [updated] (Oudshoorn et al., 2017)	Strong ⊕○○○

Normal responder

Delayed-start ovarian stimulation is probably not recommended over a conventional gonadotropin dose for predicted normal responders. [2025] (Hohmann et al., 2003; Baart et al., 2007; Lou and Huang, 2010; Blockeel et al., 2011b; Revelli et al., 2020)	Conditional ⊕○○○
Neither a reduced nor an increased gonadotropin dose is probably recommended over a conventional gonadotropin dose (equivalent to 150–225 IU) for predicted normal responders. [updated] (Ngwenya et al., 2024)	Conditional ⊕○○○

Low responder

Delayed start ovarian stimulation is probably not recommended for predicted low responders. [2025] (Revelli et al., 2020)	Conditional ⊕○○○
The use of modified natural cycle is probably not routinely recommended over conventional stimulation for low responders. [updated] (Morgia et al., 2004; Kim et al., 2009; De Marco et al., 2021)	Conditional ⊕○○○
The GDG recognizes that low responders are a heterogeneous group and in women with very low ovarian reserve, clinicians could choose to use a modified natural cycle. [2025]	GPP
A gonadotropin dose higher than 300 IU is not recommended for predicted low responders. [2019] (Ngwenya et al., 2024)	Strong ⊕○○○

Which pituitary suppression protocol is preferable?

If GnRH agonists are used, the long GnRH agonist protocol is recommended over the short or ultrashort GnRH agonist protocol. [updated] (Siristatidis et al., 2025)	Strong ⊕⊕○○
The GnRH antagonist protocol is recommended over the GnRH agonist protocols, given the comparable efficacy and higher safety in the general IVF/ICSI population. [2019] (Liu et al., 2023a)	Strong ⊕⊕⊕○

(continued)

The fixed GnRH antagonist protocol is probably recommended over the flexible GnRH antagonist protocol. [2025] (Venetis et al., 2023)	Conditional ⊕○○○
If freeze-all is planned, the use of progestin for pituitary suppression is probably equally recommended to GnRH analogues. [updated] (Glujovsky et al., 2023)	Conditional ⊕○○○
Is the type of stimulation drug associated with efficacy and safety?	
The use of recombinant human FSH (r-hFSH) and human menopausal gonadotropin (hMG) for ovarian stimulation is equally recommended. [2019] (Bordewijk et al., 2019)	Strong ⊕⊕⊕○
The use of recombinant human FSH (r-hFSH) and purified FSH (p-FSH) for ovarian stimulation in the GnRH agonist protocol is equally recommended. [2019] (van Wely et al., 2011)	Strong ⊕⊕○○
The use of either recombinant human FSH (r-hFSH) or highly purified FSH (hp-FSH) for ovarian stimulation in the GnRH agonist protocol is equally recommended. [2019] (Bordewijk et al., 2019)	Strong ⊕⊕○○
The combination of r-hFSH with r-hLH and r-hFSH alone is probably equally recommended for the general IVF population. [2025] (Mochtar et al., 2017)	Conditional ⊕⊕○○
The combination of r-hFSH with r-hLH and r-hFSH alone is probably equally recommended for low responders. [2025] (Ferraretti et al., 2014 ; Humaidan et al., 2017)	Conditional ⊕⊕○○
The combination of r-hFSH with r-hLH and r-hFSH alone is probably equally recommended for women of advanced age (≥35 years). [2025] (Conforti et al., 2021)	Conditional ⊕⊕○○
The combined use of recombinant human FSH (rFSH) with human menopausal gonadotropin (hMG), either from the start or mid-phase of ovarian stimulation, is probably not recommended over the use of either r-hFSH or hMG alone in normal and low responders. [2025] (Taronger et al., 2018 ; Shu et al., 2019 ; Decleer et al., 2020)	Conditional ⊕⊕○○
The use of long-acting and daily recombinant human FSH (r-hFSH) is equally recommended in GnRH antagonist cycles for normal responders. [2019] (Cozzolino et al., 2019)	Strong ⊕○○○
Follitropin delta and follitropin alpha/beta are equally recommended for ovarian stimulation. [2025]	Strong ⊕○○○
The use of highly purified FSH (hp-FSH) and human menopausal gonadotropin (hMG) for ovarian stimulation in GnRH agonist protocols is equally recommended. [2019] (Duijkers et al., 1993 ; Westergaard et al., 1996 ; Parsanezhad et al., 2017)	Conditional ⊕⊕○○
The use of recombinant human LH + recombinant human FSH (r-hFSH+r-hLH) for ovarian stimulation is probably not recommended over human menopausal gonadotropin (hMG) in GnRH agonist protocols with regard to safety. [2019] (Pacchiarotti et al., 2010)	Conditional ⊕○○○
Adding low dosages of hCG to the FSH stimulation is probably not recommended. [2025] (Koichi et al., 2006 ; Serafini et al., 2006 ; Madani et al., 2012 ; Thuesen et al., 2012 ; Zhu and Fu, 2019 ; Decleer et al., 2020 ; Siristatidis et al., 2022)	Conditional ⊕○○○
The addition of letrozole to gonadotropins in stimulation protocols for predicted high responders is probably not recommended. [updated] (Yang et al., 2019 ; Tshzmachyan and Hambartsumian, 2020 ; Ghasemi Tehrani et al., 2022 ; Lotfy et al., 2022)	Conditional ⊕○○○

(continued)

The addition of letrozole to gonadotropins in stimulation protocols is probably not recommended for predicted normal responders. [2019] (Mukherjee et al., 2012 ; Eftekhar and Saeed, 2020 ; Bülow et al., 2022)	Conditional ⊕○○○
The addition of letrozole to gonadotropins in stimulation protocols is probably not recommended for predicted low responders. [2019] (Qin, 2021)	Conditional ⊕⊕○○
The addition of clomiphene citrate to gonadotropins in stimulation protocols is probably not recommended for predicted high responders. [2019] (Lotfy et al., 2022)	Conditional ⊕⊕○○
The addition of clomiphene citrate to gonadotropins in stimulation protocols is probably not recommended for predicted normal responders. [2025] (Datta et al., 2021)	Conditional ⊕⊕⊕○
Clomiphene citrate alone or in combination with gonadotropins, and gonadotropin stimulation alone are probably equally recommended for predicted low responders. [updated] (Montoya-Botero et al., 2021)	Conditional ⊕⊕○○

Is adjustment of the gonadotropin dosage during the stimulation phase meaningful in terms of efficacy and safety?

Adjustment (increase or decrease) of the gonadotropin dose in the mid-stimulation phase during ovarian stimulation is probably not recommended. [2019] (van Hooft et al., 1993 ; Aboulghar et al., 2000 ; Cedrin-Durnerin et al., 2000 ; Aboulghar et al., 2004 ; Martin et al., 2006 ; Lawrenz et al., 2021 ; Xu et al., 2024)	Conditional ⊕○○○
Given the lack of evidence of the value of dose adjustments during ovarian stimulation, it is important that the gonadotropin starting dose is appropriate based on patient characteristics and desired outcome. [2025]	GPP

Is the addition of adjuncts in ovarian stimulation meaningful in terms of efficacy and safety?

Routine use of adjunct metformin before and/or during ovarian stimulation is probably not recommended when using the GnRH antagonist protocol for women with PCOS. [updated] (Tso et al., 2020)	Conditional ⊕⊕○○
Use of adjunct growth hormone before and/or during ovarian stimulation is not recommended for normal responders. [2025] (Sood et al., 2021)	Strong ⊕○○○
Use of adjunct growth hormone before and/or during ovarian stimulation is probably not recommended for low responders. [updated] (Liu et al., 2025)	Conditional ⊕○○○
Use of adjunct growth hormone before and/or during ovarian stimulation is not recommended for women with PCOS. [2025] (Gong et al., 2020)	Strong ⊕⊕○○
Use of testosterone before ovarian stimulation is probably not recommended for low responders. [updated] (Naik et al., 2024)	Conditional ⊕⊕⊕○
Use of DHEA before and/or during ovarian stimulation is not recommended for low responders. [2019] (Huang et al., 2025)	Strong ⊕⊕○○
Use of DHEA before and/or during ovarian stimulation is not recommended for normal responders. [2025] (Huang et al., 2025)	Strong ⊕⊕○○

(continued)

Use of aspirin before and/or during ovarian stimulation is not recommended in the general IVF/ICSI population, nor for low responders. [2019] (Siristatidis et al., 2016)	Strong ⊕⊕⊕○
Use of sildenafil before and/or during ovarian stimulation is not recommended for low responders. [2019] (Ataalla et al., 2016)	Strong ⊕○○○
Use of myo-inositol before and/or during ovarian stimulation is probably not recommended for women with PCOS undergoing IVF. [2025] (Showell et al., 2018)	Conditional ⊕○○○
Use of myo-inositol before and/or during ovarian stimulation is not recommended in low responders. [2025] (Nazari et al., 2020 ; Mohammadi et al., 2021)	Strong ⊕⊕○○
Use of myo-inositol before and/or during ovarian stimulation is not recommended in non-PCOS women undergoing IVF. [2025] (Seyedshohadaei et al., 2022)	Strong ⊕⊕○○

What is the safety and efficacy of non-conventional start stimulation compared to standard early follicular phase stimulation?

Random-start ovarian stimulation could be used when a fresh transfer is not intended; nonetheless, the risk of OHSS in case of concurrent spontaneous conception should always be discussed with the patient. [reworded] (Qin et al., 2016 ; Pereira et al., 2017)	GPP
Luteal start ovarian stimulation could be used when a fresh transfer is not intended, and there is no possibility of natural conception. [updated] (Cerrillo et al., 2023 ; Massin et al., 2023 ; Suñol et al., 2023 ; Boudry et al., 2024 ; Dastjerdi et al., 2024 ; Saharkhiz et al., 2024)	Conditional ⊕○○○
Late luteal phase start of gonadotropins with fresh transfer is probably not recommended for low responders. [updated] (Rombauts et al., 1998 ; Kansal Kalra et al., 2008 ; Kucuk et al., 2008)	Conditional ⊕○○○
Double stimulation can be considered for urgent fertility preservation cycles. [2019]	GPP
Double stimulation can be used with the intention to accumulate oocytes or embryos when a fresh transfer is not planned. [updated] (Cerrillo et al., 2023 ; Massin et al., 2023)	Strong ⊕⊕○○

Fertility preservation and oocyte donation

What is the preferred stimulation protocol for fertility preservation in patients facing gonadotoxic treatment?

For patients facing gonadotoxic treatment, ovarian stimulation for fertility preservation should be started irrespective of the menstrual cycle phase. [updated] (Boots et al., 2016 ; Chen et al., 2022 ; Sönmezer et al., 2023)	Strong ⊕○○○
For ovarian stimulation in women seeking fertility preservation for medical reasons, the GnRH antagonist protocol is recommended. [2019] (Boots et al., 2016 ; Rodgers et al., 2017)	Strong ⊕○○○
In ovarian stimulation for fertility preservation in oestrogen-sensitive diseases, the concomitant use of anti-oestrogen therapy, such as letrozole or tamoxifen, can be considered. [2019] (Chen et al., 2022 ; Yoshida et al., 2023)	GPP
For final oocyte maturation in patients facing gonadotoxic treatment, a GnRH agonist is preferred. [2025] (Hong et al., 2022 ; Massarotti et al., 2023)	GPP

What is the preferred stimulation protocol for elective oocyte cryopreservation?

Ovarian stimulation for elective oocyte preservation can be started irrespective of the menstrual cycle phase. [2025] (Pereira et al., 2017)	Conditional ⊕○○○
GnRH antagonist or progestin protocols are probably recommended over GnRH agonist protocols for pituitary suppression in elective oocyte cryopreservation. [2025] (Vaiaelli et al., 2024)	Conditional ⊕○○○
For final oocyte maturation in elective oocyte cryopreservation, a GnRH agonist is preferred. [2025] (Kim et al., 2020 ; Maslow et al., 2020 ; Herzberger et al., 2021)	GPP

What is the preferred stimulation protocol for oocyte donation?

Conventional follicular start or random-start ovarian stimulation is equally recommended for oocyte donation cycles. [2025] (Martinez et al., 2022 ; De Rijdt et al., 2024 ; Guerrero et al., 2024)	Strong ⊕○○○
If random-start ovarian stimulation is used, oocyte donors need to adopt contraceptive measures to prevent the possibility of a natural pregnancy. [2025]	GPP
Any type of contraception (hormonal, non-hormonal, oral, vaginal, or intrauterine) can be used before initiation of ovarian stimulation in oocyte donors. [2025]	GPP
Progestin or intrauterine contraception can be used during ovarian stimulation in oocyte donors. [2025]	GPP
For pituitary suppression in oocyte donors, the GnRH antagonist and progestin protocol is probably equally recommended. [2025] (Bodri et al., 2011 ; Martinez et al., 2021)	Conditional ⊕⊕○○
A GnRH agonist protocol for pituitary suppression is not recommended in oocyte donors. [2025]	GPP
The use of recombinant human FSH (r-hFSH), purified FSH, long-acting r-hFSH, or hMG is probably equally recommended in oocyte donors undergoing ovarian stimulation. [2025] (Söderström-Anttila et al., 1996 ; Tesarik and Mendoza, 2002 ; Acevedo et al., 2004 ; Melo et al., 2010 ; Cruz et al., 2017 ; Alvarado Franco et al., 2023)	Conditional ⊕○○○
Gonadotropin dose should be individualized based on ovarian reserve, with the goal to maintain donors' safety and also to obtain an optimal number of oocytes. [2025]	GPP
The routine use of a GnRH agonist trigger is recommended in oocyte donors using the GnRH antagonist or progestin protocols for pituitary suppression. [2025] (Youssef et al., 2014)	Strong ⊕⊕○○
The use of an hCG trigger is not routinely recommended in oocyte donation cycles. [2025] (Youssef et al., 2014)	Strong ⊕⊕○○

Monitoring

Is the addition of hormonal assessment (oestradiol/ progesterone/LH) to ultrasound monitoring improving efficacy and safety?

The addition of oestradiol measurements to ultrasound monitoring is probably not recommended. [2019] (Kwan et al., 2021)	Conditional ⊕⊕○○
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(continued)

The addition of a hormonal panel consisting of a combination of oestradiol, progesterone, and LH measurements to ultrasound monitoring is probably not recommended. [2019] (Golan et al., 1994; Wiser et al., 2012)

Conditional
⊕○○○

Does monitoring of endometrial thickness affect the efficacy and safety?

Routine monitoring of endometrial thickness during controlled ovarian stimulation is probably not recommended. [2019] (Kasius et al., 2014; Gao et al., 2020)

Conditional
⊕○○○

The guideline group suggests performing a single measurement of the endometrium during ultrasound assessment on the day of triggering or oocyte pick-up to counsel patients on the potential lower pregnancy chance. [2019]

GPP

Is the outcome of ovarian stimulation dependent on the criteria for final oocyte maturation?

The association of follicle size as a triggering criterion with outcome has not been sufficiently studied. Physicians may choose the follicle size upon which final oocyte maturation is triggered on a case-by-case basis. [2019] (Chen et al., 2014)

Conditional
⊕⊕○○

The decision on timing of triggering in relation to follicle size is multi-factorial, taking into account the size of the growing follicle cohort, the hormonal data on the day of the pursued trigger, duration of stimulation, embryo transfer strategy, patient burden, financial costs, experience of previous cycles, and organizational factors for the centre. Most often, final oocyte maturation is triggered at sizes of several of the leading follicles between 16 and 22 mm. [reworded]

GPP

The GDG does not recommend to base timing of final oocyte maturation triggering on oestradiol levels alone. [2019]

GPP

The GDG does not recommend to base timing of final oocyte maturation on oestradiol/follicle ratio alone. [2019]

GPP

Is hormonal assessment on the day of final oocyte maturation recommended?

It is probably recommended to measure serum progesterone levels on the day of final oocyte maturation in cycles aimed for a fresh embryo transfer. [2025] (Venetis et al., 2013)

Conditional
⊕○○○

If serum progesterone levels are high, the patient should be counselled about potentially lower ongoing pregnancy/live birth rates. The decision to defer embryo transfer should include other factors (number of oocytes, number of embryos, and embryo quality). [2025]

GPP

It is not recommended to routinely measure serum oestradiol levels on the day of hCG trigger in ovarian stimulation cycles with the intent for a fresh embryo transfer. [2025] (Karatasiou et al., 2020)

Strong
⊕○○○

It is not recommended to measure serum LH levels on the day of hCG trigger in ovarian stimulation cycles aimed for a fresh embryo transfer. [2025] (Zhang et al., 2022; Luo et al., 2023; Zhou et al., 2023)

Strong
⊕○○○

It is not recommended to measure serum oestradiol, progesterone, or luteinizing hormone levels on the day of a GnRH agonist trigger in freeze-all cycles. [2025] (Kummer et al., 2013; Lu et al., 2016; Popovic-Todorovic et al., 2019; Gambini et al., 2024)

Strong
⊕○○○

Which criteria for cycle cancellation are meaningful regarding predicted low/high oocyte yield?

A low response to ovarian stimulation alone is not a reason to cancel a cycle. [2019] (Oudendijk et al., 2012)

Strong
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The physician should counsel the individual unexpected low responder regarding pregnancy prospects and decide individually whether to continue this cycle. [updated]

GPP

In GnRH agonist cycles with an ovarian response of ≥ 19 follicles of ≥ 11 mm, there is an increased risk of OHSS and preventative measures are recommended, which should include primarily cancelling the final oocyte maturation trigger. [updated] (Mathur et al., 2000; Papanikolaou et al., 2006; Steward et al., 2014; Griesinger et al., 2016)

Strong
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In GnRH antagonist cycles, withholding GnRH agonist triggering may still be considered in women with extremely high ovarian response. [2025]

GPP

Triggering ovulation and luteal support

What is the preferred drug for triggering final oocyte maturation in terms of efficacy and safety in the overall IVF/ICSI population?

The use of recombinant hCG and urinary hCG is equally recommended for triggering final oocyte maturation in ovarian stimulation protocols. [2019] (Youssef et al., 2016)

Strong
⊕⊕○○

A reduced dose of 5000 IU urinary hCG for final oocyte maturation is probably recommended over a 10 000 IU dose in GnRH agonist protocols, as it may improve safety. [2019] (Shaltout et al., 2006; Kolibianakis et al., 2007; Madani et al., 2013)

Conditional
⊕○○○

It is not recommended to administer recombinant human LH for triggering final oocyte maturation. [2019] (Youssef et al., 2016)

Strong
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The use of GnRH agonist for final oocyte maturation is not recommended in the general IVF/ICSI population with fresh transfer, regardless of luteal phase support (with or without LH-activity). [updated] (Beebejaun et al., 2025)

Strong
⊕⊕○○

If the GnRH agonist trigger with triptorelin is applied, dosages ranging between 0.1 and 0.4 mg can be chosen. [2019]

GPP

The addition of a GnRH agonist to hCG as a dual trigger for final oocyte maturation is probably not recommended for predicted normal responders. [2019] (Beebejaun et al., 2025)

Conditional
⊕⊕○○

The addition of a GnRH agonist to hCG as a dual trigger for final oocyte maturation is probably not recommended for low responders. [2025] (He et al., 2023; Keskin et al., 2023)

Conditional
⊕⊕○○

What is the efficacy and safety of luteal support protocols?

Progesterone is recommended for luteal phase support after IVF/ICSI. [2019] (Hurd et al., 1996; Abate et al., 1999)

Strong
⊕○○○

Any of the previously mentioned administration routes (non-oral) for natural progesterone as luteal phase support can be used. [2019]

GPP

(continued)

The dosing of natural progesterone has evolved empirically, usually dosages used include: 50 mg once daily for intramuscular progesterone 25 mg once daily for subcutaneous progesterone 90 mg once daily for vaginal progesterone gel 200 mg three times daily for micronized vaginal progesterone in-oil capsules 100 mg two or three times daily for micronized vaginal progesterone in starch suppositories 400 mg two times daily for vaginal pessary. [2019]	GPP
Starting progesterone for luteal phase support should be in the window between the evening of the day of oocyte retrieval and day 3 post oocyte retrieval. [2019]	GPP
Progesterone support should be administered until at least the day of the pregnancy test. [2019]	GPP
Dydrogesterone is probably recommended for luteal phase support. [2019] (Griesinger et al., 2020) <i>There are reports on a relation between dydrogesterone exposure and the occurrence of congenital malformations. These observed relations cannot be translated into a conclusion on causality, and therefore are considered as potential associations.</i>	Conditional ⊕⊕⊕○
The addition of oestradiol to progesterone for luteal phase support is probably not recommended. [2019] (van der Linden et al., 2015)	Conditional ⊕⊕○○
In hCG-triggered ovarian stimulation cycles, hCG as luteal phase support in standard dosages of 1500 IU is not recommended. [updated] (van der Linden et al., 2015)	Strong ⊕⊕○○
A GnRH agonist bolus, in addition to progesterone for luteal phase support in hCG-triggered cycles is probably not recommended. [updated] (Liu et al., 2022)	Conditional ⊕⊕○○
Repeated GnRH agonist injections, alone or in addition to progesterone for luteal phase support in hCG-triggered cycles is probably not recommended. [reworded] (van der Linden et al., 2015)	Conditional ⊕○○○
The addition of LH to progesterone for luteal phase support can only be used in the context of a clinical trial. [2019]	Research only

Prevention of OHSS

Which is the best strategy to reduce OHSS in the observed high responder regarding ovulation triggering and embryo transfer strategy?

A GnRH agonist trigger is recommended for final oocyte maturation in women at risk of OHSS combined with a freeze-all strategy to minimize the risk of severe OHSS. [updated] (Babayof et al., 2006 ; Engmann et al., 2008 ; Humaidan et al., 2013 ; Youssef et al., 2014 ; Aflatoonian et al., 2018 ; Santos-Ribeiro et al., 2020)	Strong ⊕○○○
If a GnRH agonist protocol with hCG trigger is used in high responders, a freeze-all strategy is recommended to decrease the risk of late-onset OHSS. [updated]	GPP
The addition of hCG to GnRH agonist as a dual trigger for final oocyte maturation is probably not recommended for high responders. [2025] (He et al., 2022 ; Wang et al., 2024)	Conditional ⊕○○○
In patients at risk of OHSS, the use of a GnRH agonist for final oocyte maturation is probably recommended over hCG in cases where no fresh transfer is performed. [2019] (Borges et al., 2016 ; Tannus et al., 2017)	Conditional ⊕○○○
A GnRH agonist trigger for final oocyte maturation with or without a freeze-all strategy is preferred over a coasting strategy in patients at risk of OHSS. [2019] (DiLuigi et al., 2010 ; Herrero et al., 2011)	GPP
Dopamine agonists are recommended to decrease the risk of early OHSS, particularly in patients receiving hCG for final oocyte maturation. [2025] (Tang et al., 2021)	Strong ⊕⊕○○

Is the freeze-all protocol meaningful in the prevention of ovarian hyper-stimulation syndrome also with regards to efficacy?

A freeze-all strategy is recommended to minimize the risk of late-onset OHSS. [updated] (Zaat et al., 2021)	Strong ⊕⊕○○
Prior to the start of ovarian stimulation, a risk assessment for high response is advised with the purpose of applying personalised treatment choices on pituitary suppression protocol, FSH dosage, final oocyte maturation trigger, and embryo transfer strategy. [updated]	GPP

Discussion

The updated ESHRE guideline on ovarian stimulation for IVF/ICSI aims to supply healthcare providers with the best available evidence for approaches in the various steps and phases of OS for IVF/ICSI.

All recommendations in the guideline were formulated after an assessment of the best available evidence in the literature and discussion within the GDG, taking into account the balance of benefits versus harms, patient preferences, clinicians' expertise, and resource use. The guideline provides a total of 121 recommendations: 42 recommendations remained unchanged, 4 recommendations were reworded for better understanding, 29 recommendations were updated in view of new evidence, and 46 new recommendations for 2025 have been formulated. The guideline provides 4 recommendations on pre-stimulation evaluation, 7 recommendations on pre-treatment therapies, 50 recommendations on pituitary suppression and ovarian stimulation, 17 recommendations on monitoring, 18 recommendations on triggering of final oocyte maturation and luteal support, and 8 recommendations on the prevention of OHSS. In addition, the guideline provides 17 recommendations on fertility preservation, both oncologic and elective, and oocyte donation. These include 90 evidence-based recommendations, of which only 42 were formulated as strong recommendations, as well as 29 good practice points and 2 research-only recommendations. Of the evidence-based recommendations, none were supported by high-quality evidence, 6 by moderate-quality evidence, 36 by low-quality evidence, and 148 by very low-quality evidence. To support future research on ovarian stimulation for IVF/ICSI, a list of research recommendations was provided.

With this update of the ovarian stimulation guideline, the guideline development group (GDG) would like to highlight their preference in changing the terminology for the different types of responders from poor, normal, and excessive to low, normal, and high. In addition, they would like to advice clinicians to refrain from using non-standardized terminology, such as 'healthy' responders, 'kind' stimulation, etc.

The GDG also took the opportunity to improve its structure to make it even more clear and even more user-friendly. This resulted in adaptations in the chapter on pre-stimulation evaluation, where now the same diagnostic tests are discussed for assessment of ovarian response as for pregnancy prediction. In addition, the key question on fertility preservation was split up into three parts: fertility preservation for women facing gonadotoxic treatment, elective oocyte cryopreservation, and oocyte donation. Even though freeze-all cycles are used in most cases for all three indications, it is clear that these are three different patient populations, requiring a different strategy for ovarian stimulation and thus separate recommendations were in order.

The section on stimulation protocols for high, normal, and low responders was also reviewed from a different perspective by the GDG. For starters, the GDG wanted to highlight in this updated guideline that a conventional gonadotropin dose is equivalent to 150–225 IU. Secondly, after much consideration, the GDG decided to discard the concept of ‘mild stimulation’ from the guideline. Mild stimulation is defined by ICMART as a protocol with the intention of limiting the number of oocytes following stimulation for IVF (Zegers-Hochschild *et al.*, 2017). However, as it is an intended approach, it is difficult to decide on a gonadotropin starting dose to obtain this limited number of oocytes. Furthermore, studies published on the topic are very heterogeneous, often unclear in methodology, or using a total gonadotropin dose that is equivalent to conventional stimulation. Comparing and combining these studies to be able to make relevant and evidence-based decisions is therefore not feasible. Lastly, dose comparisons of gonadotropins were introduced. In the previous version of the guideline, dose comparisons were not explicitly presented, and comparisons with higher gonadotropin dosages were only included for low responders. It has been made clear now that there are limited indications to deviate from conventional gonadotropin dosing.

Several new interventions were added to the chapter on gonadotropins, such as follitropin delta, combinations of FSH with hMG, and combinations of FSH and hCG. With regard to follitropin delta, there was some discussion about the RCTs comparing follitropin delta to follitropin alpha. Some GDG members felt that these RCTs included two interventions, i.e. different follitropin medications and individualized versus conventional dosing of the follitropin medications. Other GDG members disagreed, arguing that, in order to show non-inferiority, the new follitropin delta medications, which can only be administered by individualized, algorithm-based dosing, had to be compared to conventional dosing in the control arm. Because of the non-inferiority in efficacy outcomes, and improved safety profile in terms of OHSS (because of the individualized dosing), a strong recommendation in favour of follitropin delta was issued. With regard to the combination of FSH with hMG or hCG, while the GDG understands the rationale of adding LH-activity in the mid-follicular phase during ovarian stimulation with recombinant human FSH, the evidence clearly shows no benefit in terms of (cumulative) live birth rates. Therefore, it is not surprising that these combinations are not recommended by the GDG.

One completely new key question that was introduced in the guideline is the need for hormonal assessment (progesterone, oestrogen, or LH) on the day of final oocyte maturation. The GDG felt this question was overlooked in the previous version of the guideline. The evidence is consistently showing lower live birth rates with elevated progesterone, resulting in the expectation of a strong recommendation in favour of measuring progesterone on the day of final oocyte maturation. However, the GDG felt the recommendation had to be very nuanced. For diagnostic tests, the GDG feels strongly that unless an intervention or treatment is available to rectify the abnormality, the test should not be recommended. In the case of elevated progesterone levels on the day of final oocyte maturation, current evidence shows that the reduction in live birth rates is not seen after a frozen embryo transfer. However, when considering the freeze-all strategy, several factors need to be taken into account, such as the number of oocytes, the number of embryos, and embryo quality. Therefore, only a conditional (weak) statement was formulated in favour of measuring progesterone levels on the day of final oocyte maturation.

Research gaps were detected in several areas, and the top three topics are documented in a list of recommendations for further research ([Supplementary Data File S1](#)).

Despite the limitations of guidelines in general, and the limitations in the evidence supporting the current guideline, the guideline group is confident that this document will help best practice in ovarian stimulation for IVF/ICSI.

Supplementary data

[Supplementary data](#) are available at *Human Reproduction* online.

Data availability

The data underlying this article are available in the article and in its online [supplementary material](#).

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Authors' roles

FB chaired the GDG and hence fulfilled a leading role in collecting the evidence, writing the manuscript, and dealing with reviewer comments. NLC, as the methodological expert, performed all literature searches for the guideline, provided methodological support, and coordinated the guideline development. All other authors, listed in alphabetical order, as GDG members, contributed equally to the manuscript by drafting key questions, synthesizing evidence, writing different parts of the guideline, and discussing recommendations until consensus within the group was reached.

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References

- Abate A, Brigandi A, Abate FG, Manti F, Unfer V, Perino M. Luteal phase support with 17alpha-hydroxyprogesterone versus unsupported cycles in in vitro fertilization: a comparative randomized study. *Gynecol Obstet Invest* 1999;**48**:78–80.
- Aboulghar MA, Mansour RT, Serour GI, Al-Inany HG, Amin YM, Aboulghar MM. Increasing the dose of human menopausal gonadotrophins on day of GnRH antagonist administration: randomized controlled trial. *Reprod Biomed Online* 2004;**8**:524–527.
- Aboulghar MA, Mansour RT, Serour GI, Rhodes CA, Amin YM. Reduction of human menopausal gonadotropin dose before coasting prevents severe ovarian hyperstimulation syndrome with minimal cycle cancellation. *J Assist Reprod Genet* 2000;**17**:298–301.
- Acevedo B, Sanchez M, Gomez JL, Cuadros J, Ricciarelli E, Hernández ER. Luteinizing hormone supplementation increases pregnancy rates in gonadotropin-releasing hormone antagonist donor cycles. *Fertil Steril* 2004;**82**:343–347.
- Aflatoonian A, Mansoori-Torshizi M, Farid Mojtahedi M, Aflatoonian B, Khalili MA, Amir-Arjmand MH, Soleimani M, Aflatoonian N, Oskouian H, Tabibnejad N, et al.; The Fertility Clinic, Skive Regional Hospital and Faculty of Health, Aarhus University, Aarhus, Denmark. Fresh versus frozen embryo transfer after gonadotropin-releasing hormone agonist trigger in gonadotropin-releasing hormone antagonist cycles among high responder women: a randomized, multi-center study. *IJRM* 2018;**16**:9–18.
- Alvarado Franco CA, Bernabeu García A, Suñol Sala J, Guerrero Villena J, Albero Amorós S, Llacer J, Delgado Navas RA, Ortiz JA, Pitas A, Castillo Farfan JC et al. Conventional ovarian stimulation vs. delayed single dose corifollitropin alfa ovarian stimulation in oocyte donors: a prospective randomized study. Tail trial. *Front Reprod Health* 2023;**5**:1239175.
- Andrews J, Guyatt G, Oxman AD, Alderson P, Dahm P, Falck-Ytter Y, Nasser M, Meerpohl J, Post PN, Kunz R et al. GRADE guidelines: 14. Going from evidence to recommendations: the significance and presentation of recommendations. *J Clin Epidemiol* 2013;**66**:719–725.
- Arce JC, Andersen AN, Fernández-Sánchez M, Visnova H, Bosch E, García-Velasco JA, Barri P, de Sutter P, Klein BM, Fauser BC. Ovarian response to recombinant human follicle-stimulating hormone: a randomized, antiMüllerian hormone-stratified, dose-response trial in women undergoing in vitro fertilization/intracytoplasmic sperm injection. *Fertil Steril* 2014;**102**:1633–1640.e5.
- Ataalla W, Elhamid T, Elhalwagy A. Adjuvant sildenafil therapy in poor responders undergoing in vitro fertilization: a prospective, randomized, double-blind, placebo-controlled trial. *Middle East Fertil Soc J* 2016;**21**:175–179.
- Baart EB, Martini E, Eijkemans MJ, Van Opstal D, Beckers NG, Verhoeff A, Macklon NS, Fauser BC. Milder ovarian stimulation for in-vitro fertilization reduces aneuploidy in the human preimplantation embryo: a randomized controlled trial. *Hum Reprod* 2007;**22**:980–988.
- Babayof R, Margalioth EJ, Huleihel M, Amash A, Zylber-Haran E, Gal M, Brooks B, Mimoni T, Eldar-Geva T. Serum inhibin A, VEGF and TNFalpha levels after triggering oocyte maturation with GnRH agonist compared with HCG in women with polycystic ovaries undergoing IVF treatment: a prospective randomized trial. *Hum Reprod* 2006;**21**:1260–1265.
- Beebejaun Y, Copeland T, Duffy JMN, Sarris I, Showell M, Wang R, Sunkara SK. Triggering oocyte maturation in in vitro fertilization treatment in healthy responders: a systematic review and network meta-analysis. *Fertil Steril* 2025;**123**:812–826.
- Beretsos P, Partsinevelos GA, Arabatzi E, Drakakis P, Mavrogianni D, Anagnostou E, Stefanidis K, Antsaklis A, Loutradis D. "hCG priming" effect in controlled ovarian stimulation through a long protocol. *Reprod Biol Endocrinol* 2009;**7**:91.
- Blockeel C, Riva A, De Vos M, Haentjens P, Devroey P. Administration of a gonadotropin-releasing hormone antagonist during the 3 days before the initiation of the in vitro fertilization/intracytoplasmic sperm injection treatment cycle: impact on ovarian stimulation. A pilot study. *Fertil Steril* 2011a;**95**:1714–1719. e1711–1712.
- Blockeel C, Sterrenburg MD, Broekmans FJ, Eijkemans MJ, Smits J, Devroey P, Fauser BC. Follicular phase endocrine characteristics during ovarian stimulation and GnRH antagonist cotreatment for IVF: RCT comparing recFSH initiated on cycle day 2 or 5. *J Clin Endocrinol Metab* 2011b;**96**:1122–1128.
- Bodri D, Sunkara SK, Coomarasamy A. Gonadotropin-releasing hormone agonists versus antagonists for controlled ovarian hyperstimulation in oocyte donors: a systematic review and meta-analysis. *Fertil Steril* 2011;**95**:164–169.

- Boots CE, Meister M, Cooper AR, Hardi A, Jungheim ES. Ovarian stimulation in the luteal phase: systematic review and meta-analysis. *J Assist Reprod Genet* 2016;**33**:971–980.
- Bordewijk EM, Mol F, van der Veen F, Van Wely M. Required amount of rFSH, HP-hMG and HP-FSH to reach a live birth: a systematic review and meta-analysis. *Hum Reprod Open* 2019;**2019**:hoz008.
- Borges E, Jr., Braga DP, Setti AS, Vingris LS, Figueira RC, Iaconelli A, Jr., Strategies for the management of OHSS: Results from freezing-all cycles. *JBRA Assist Reprod* 2016;**20**:8–12.
- Boudry L, Mateizel I, Wouters K, Papaleo E, Mackens S, De Vos M, Racca A, Adriaenssens T, Tournaye H, Blockeel C. Does dual oocyte retrieval with continuous FSH administration increase the number of mature oocytes in low responders? An open-label randomized controlled trial. *Hum Reprod* 2024;**39**:538–547.
- Broekmans FJ, Kwee J, Hendriks DJ, Mol BW, Lambalk CB. A systematic review of tests predicting ovarian reserve and IVF outcome. *Hum Reprod Update* 2006;**12**:685–718.
- Broer SL, Dolleman M, van Disseldorp J, Broeze KA, Opmeer BC, Bossuyt PM, Eijkemans MJ, Mol BW, Broekmans FJ; IPD-EXPORT Study Group Prediction of an excessive response in in vitro fertilization from patient characteristics and ovarian reserve tests and comparison in subgroups: an individual patient data meta-analysis. *Fertil Steril* 2013a;**100**:420–429.e7. e427.
- Broer SL, van Disseldorp J, Broeze KA, Dolleman M, Opmeer BC, Bossuyt P, Eijkemans MJ, Mol B-WJ, Broekmans FJM, Broer SL, et al.; on behalf of the IMPORT Study Group. Added value of ovarian reserve testing on patient characteristics in the prediction of ovarian response and ongoing pregnancy: an individual patient data approach. *Hum Reprod Update* 2013b;**19**:26–36.
- Bülow NS, Skouby SO, Warzecha AK, Udengaard H, Andersen CY, Holt MD, Grøndahl ML, Nyboe Andersen A, Sopa N, Mikkelsen ALE et al. Impact of letrozole co-treatment during ovarian stimulation with gonadotrophins for IVF: a multicentre, randomized, double-blinded placebo-controlled trial. *Hum Reprod* 2022;**37**:309–321.
- Casano S, Guidetti D, Patriarca A, Pittatore G, Gennarelli G, Revelli A. MILD ovarian stimulation with GnRH-antagonist vs. long protocol with low dose FSH for non-PCO high responders undergoing IVF: a prospective, randomized study including thawing cycles. *J Assist Reprod Genet* 2012;**29**:1343–1351.
- Cedrin-Durnerin I, Bstandig B, Herve F, Wolf J, Uzan M, Hugues J. A comparative study of high fixed-dose and decremental-dose regimens of gonadotropins in a minidose gonadotropin-releasing hormone agonist flare protocol for poor responders. *Fertil Steril* 2000;**73**:1055–1056.
- Cerrillo M, Cecchino GN, Toribio M, García-Rubio MJ, García-Velasco JA. A randomized, non-inferiority trial on the DuoStim strategy in PGT-A cycles. *Reprod Biomed Online* 2023;**46**:536–542.
- Chen CN, Chang LT, Chen CH, Tam KW. Fertility preservation for women with breast cancer before chemotherapy: a systematic review and meta-analysis. *Reprod Biomed Online* 2022;**44**:357–369.
- Chen Y, Zhang Y, Hu M, Liu X, Qi H. Timing of human chorionic gonadotropin (hCG) hormone administration in IVF/ICSI protocols using GnRH agonist or antagonists: a systematic review and meta-analysis. *Gynecol Endocrinol* 2014;**30**:431–437.
- Conforti A, Esteves SC, Humaidan P, Longobardi S, D'Hooghe T, Orvieto R, Vaiarelli A, Cimagomo D, Rienzi L, Ubaldi FM et al. Recombinant human luteinizing hormone co-treatment in ovarian stimulation for assisted reproductive technology in women of advanced reproductive age: a systematic review and meta-analysis of randomized controlled trials. *Reprod Biol Endocrinol* 2021;**19**:91.
- Cozzolino M, Vitagliano A, Cecchino GN, Ambrosini G, Garcia-Velasco JA. Corifollitropin alfa for ovarian stimulation in in vitro fertilization: a systematic review and meta-analysis of randomized controlled trials. *Fertil Steril* 2019;**111**:722–733.
- Cruz M, Alamá P, Muñoz M, Collado D, Blanes C, Solbes E, Requena A. Economic impact of ovarian stimulation with corifollitropin alfa versus conventional daily gonadotropins in oocyte donors: a randomized study. *Reprod Biomed Online* 2017;**34**:605–610.
- Dastjerdi MV, Ansari-pour S, Ataei M, Gharedaghi R, Hoseini SMM, Mohazzab A, Zafardoust S. Comparison of luteal phase stimulation with follicular phase stimulation in poor ovarian response: a single-blinded randomized controlled trial. *Contracept Reprod Med* 2024;**9**:6.
- Datta AK, Maheshwari A, Felix N, Campbell S, Nargund G. Mild versus conventional ovarian stimulation for IVF in poor, normal and hyper-responders: a systematic review and meta-analysis. *Hum Reprod Update* 2021;**27**:229–253.
- De Marco MP, Montanari G, Ruscito I, Giallardo A, Ubaldi FM, Rienzi L, Costanzi F, Caserta D, Schimberni M, Schimberni M. Natural cycle results in lower implantation failure than ovarian stimulation in advanced-age poor responders undergoing IVF: Fertility Outcomes from 585 Patients. *Reprod Sci* 2021;**28**:1967–1973.
- De Rijdt S, Illingworth K, De Munck N, Tournaye H, Mackens S, De Vos M, Blockeel C. Early versus late follicular phase ovarian stimulation: a randomized controlled trial. *Reprod Biomed Online* 2024;**49**:103889.
- Decler W, Comhaire F, Balduyck J, Ameye A, Osmanagaoglu K, Devroey P. Replacing HMG/FSH by low-dose HCG to complete corifollitropin alfa stimulation reduces cost per clinical pregnancy: a randomized pragmatic trial. *Reprod Biomed Online* 2020;**40**:468–474.
- DiLuigi AJ, Engmann L, Schmidt DW, Maier DB, Nulsen JC, Benadiva CA. Gonadotropin-releasing hormone agonist to induce final oocyte maturation prevents the development of ovarian hyperstimulation syndrome in high-risk patients and leads to improved clinical outcomes compared with coasting. *Fertil Steril* 2010;**94**:1111–1114.
- Doody K, Devroey P, Gordon K, Witjes H, Mannaerts B. LH concentrations do not correlate with pregnancy in rFSH/GnRH antagonist cycles. *Reprod Biomed Online* 2010;**20**:565–567.
- Duijkers IJ, Vemer HM, Hollanders JM, Willemsen WN, Bastiaans LA, Hamilton CJ, Thomas CM, Borm GF. Different follicle stimulating hormone/luteinizing hormone ratios for ovarian stimulation. *Hum Reprod* 1993;**8**:1387–1391.
- Eftekhar M, Bagheri RB, Neghab N, Hosseini-sadat R. Evaluation of pretreatment with Cetrotide in an antagonist protocol for patients with PCOS undergoing IVF/ICSI cycles: a randomized clinical trial. *JBRA Assist Reprod* 2018;**22**:238–243.
- Eftekhar M, Saeed L. Effect of adding letrozole to gonadotropin on in vitro fertilization outcomes: an RCT. *Int J Reprod Biomed* 2020;**18**:287–294.
- Engmann L, DiLuigi A, Schmidt D, Nulsen J, Maier D, Benadiva C. The use of gonadotropin-releasing hormone (GnRH) agonist to induce oocyte maturation after cotreatment with GnRH antagonist in high-risk patients undergoing in vitro fertilization prevents the risk of ovarian hyperstimulation syndrome: a prospective randomized controlled study. *Fertil Steril* 2008;**89**:84–91.
- Farquhar C, Rombauts L, Kremer JA, Lethaby A, Ayeleke RO. Oral contraceptive pill, progestogen or oestrogen pretreatment for ovarian stimulation protocols for women undergoing assisted reproductive techniques. *Cochrane Database Syst Rev* 2017;**5**:Cd006109.
- Ferraretti AP, Gianaroli L, Motrenko T, Feliciani E, Tabanelli C, Magli MC. LH pretreatment as a novel strategy for poor responders. *Biomed Res Int* 2014;**2014**:926172.

- Gambini S, Sonigo C, Robin G, Cedrin-Durnerin I, Vinolas C, Sifer C, Boumerdassi Y, Mayeur A, Gallot V, Grynberg M et al. Risk factors for poor oocyte yield and oocyte immaturity after GnRH agonist triggering. *Hum Reprod* 2024;**39**:963–973.
- Gao G, Cui X, Li S, Ding P, Zhang S, Zhang Y. Endometrial thickness and IVF cycle outcomes: a meta-analysis. *Reprod Biomed Online* 2020;**40**:124–133.
- Ghasemi Tehrani H, Aasasi K, Mardanian F, Mehrabian F, Movahedi M, Naghshineh E. Evaluation of the effect of letrozole in the ovarian hyperstimulation syndrome prevention in participants at risk of treatment with ovulation-stimulating drugs: a randomized controlled trial. *Rep Biochem Mol Biol* 2022;**11**:386–393.
- Glujovsky D, Pesce R, Miguens M, Sueldo C, Ciapponi A; Cochrane Gynaecology and Fertility Group Progestogens for prevention of luteinising hormone (LH) surge in women undergoing controlled ovarian hyperstimulation as part of an assisted reproductive technology (ART) cycle. *Cochrane Database of Systematic Reviews* 2023;**11**:CD013827
- Golan A, Herman A, Soffer Y, Bukovsky I, Ron-El R. Ultrasonic control without hormone determination for ovulation induction in in-vitro fertilization/embryo transfer with gonadotrophin-releasing hormone analogue and human menopausal gonadotrophin. *Hum Reprod* 1994;**9**:1631–1633.
- Gong Y, Luo S, Fan P, Jin S, Zhu H, Deng T, Quan Y, Huang W. Growth hormone alleviates oxidative stress and improves oocyte quality in Chinese women with polycystic ovary syndrome: a randomized controlled trial. *Sci Rep* 2020;**10**:18769.
- Griesinger G, Blockeel C, Kahler E, Pexman-Fieth C, Olofsson JI, Driessen S, Tournaye H. Dydrogesterone as an oral alternative to vaginal progesterone for IVF luteal phase support: A systematic review and individual participant data meta-analysis. *PLoS One* 2020;**15**:e0241044.
- Griesinger G, Verweij PJ, Gates D, Devroey P, Gordon K, Stegmann BJ, Tarlatzis BC. Prediction of ovarian hyperstimulation syndrome in patients treated with corifollitropin alfa or rFSH in a GnRH antagonist protocol. *PLoS One* 2016;**11**:e0149615.
- Guerrero J, Castillo JC, Ten J, Ortiz JA, Lledó B, Orozco D, Quereda F, Bernabeu A, Bernabeu R. Random-start ovarian stimulation in an oocyte donation programme: a large, single-centre, experience. *Reprod Biomed Online* 2024;**48**:103572.
- He FF, Hu W, Yong L, Li YM. Triggering of ovulation for GnRH-antagonist cycles in normal and low ovarian responders undergoing IVF/ICSI: A systematic review and meta-analysis of randomized trials. *Eur J Obstet Gynecol Reprod Biol* 2023;**289**:65–73.
- He Y, Tang Y, Chen S, Liu J, Liu H. Effect of GnRH agonist alone or combined with different low-dose hCG on cumulative live birth rate for high responders in GnRH antagonist cycles: a retrospective study. *BMC Pregnancy Childbirth* 2022;**22**:172.
- Herrero L, Pareja S, Losada C, Cobo AC, Pellicer A, Garcia-Velasco JA. Avoiding the use of human chorionic gonadotropin combined with oocyte vitrification and GnRH agonist triggering versus coasting: a new strategy to avoid ovarian hyperstimulation syndrome. *Fertil Steril* 2011;**95**:1137–1140.
- Herzberger EH, Knaeh S, Amir H, Reches A, Ben-Yosef D, Kalma Y, Azem F, Samara N. Gonadotropin-releasing hormone agonist versus recombinant human chorionic gonadotropin triggering in fertility preservation cycles. *Reprod Sci* 2021;**28**:3390–3396.
- Hohmann F, Macklon N, Fauser B. A randomized comparison of two ovarian stimulation protocols with gonadotropin-releasing hormone (GnRH) antagonist cotreatment for in vitro fertilization commencing recombinant follicle-stimulating hormone on cycle day 2 or 5 with the standard long GnRH agonist protocol. *J Clin Endocrinol Metab* 2003;**88**:166–173.
- Hong YH, Kim SK, Lee JR, Jee BC, Suh CS. Clinical efficacy of dual trigger with human chorionic gonadotropin and a gonadotropin-releasing hormone agonist for women undergoing fertility preservation. *Reprod Med Biol* 2022;**21**:e12440.
- Huang L, Gao Y, Liang S, Jiang M. Administration of dehydroepiandrosterone improves endometrial thickness in women undergoing IVF/ICSI: a systematic review and meta-analysis. *J Ovarian Res* 2025;**18**:35.
- Humaidan P, Chin W, Rogoff D, D'Hooghe T, Longobardi S, Hubbard J, Schertz J. Efficacy and safety of follitropin alfa/lutropin alfa in ART: a randomized controlled trial in poor ovarian responders. *Hum Reprod* 2017;**32**:1537–1538.
- Humaidan P, Polyzos NP, Alsbjerg B, Erb K, Mikkelsen AL, Elbaek HO, Papanikolaou EG, Andersen CY. GnRHa trigger and individualized luteal phase hCG support according to ovarian response to stimulation: two prospective randomized controlled multicentre studies in IVF patients. *Hum Reprod* 2013;**28**:2511–2521.
- Hurd WW, Randolph JF, Jr., Christman GM, Ansbacher R, Menge AC, Gell JS. Luteal support with both estradiol and progesterone after clomiphene citrate stimulation for in vitro fertilization. *Fertil Steril* 1996;**66**:587–592.
- Ishihara O, Klein BM, Arce JC; Japanese Follitropin Delta Phase 2 Trial Group. Randomized, assessor-blind, antiMüllerian hormone-stratified, dose-response trial in Japanese in vitro fertilization/intracytoplasmic sperm injection patients undergoing controlled ovarian stimulation with follitropin delta. *Fertil Steril* 2021;**115**:1478–1486.
- Kansal Kalra S, Ratcliffe S, Gracia CR, Martino L, Coutifaris C, Barnhart KT. Randomized controlled pilot trial of luteal phase recombinant FSH stimulation in poor responders. *Reprod Biomed Online* 2008;**17**:745–750.
- Karatasios GI, Bosdou JK, Venetis CA, Zepiridis L, Chatzimeletiou K, Tarlatzis TB, Lainas G, Tarlatzis BC, Grimbizis G, Kolibianakis EM. Is the probability of pregnancy after ovarian stimulation for IVF associated with serum estradiol levels on the day of triggering final oocyte maturation with hCG? A systematic review and meta-analysis. *J Assist Reprod Genet* 2020;**37**:1531–1541.
- Kasius A, Smit JG, Torrance HL, Eijkemans MJ, Mol BW, Opmeer BC, Broekmans FJ. Endometrial thickness and pregnancy rates after IVF: a systematic review and meta-analysis. *Hum Reprod Update* 2014;**20**:530–541.
- Keskin M, Ececiş T, Atik A, Yeğen P, Kalkan E, Yücel GS. Cycle outcomes of dual trigger (GnRH agonist+hCG) versus human chorionic gonadotropin trigger alone in POSEDION group 3-4 poor-responders and normo-responders: A prospective randomized study. *J Gynecol Obstet Hum Reprod* 2023;**52**:102633.
- Kim CH, Kim SR, Cheon YP, Kim SH, Chae HD, Kang BM. Minimal stimulation using gonadotropin-releasing hormone (GnRH) antagonist and recombinant human follicle-stimulating hormone versus GnRH antagonist multiple-dose protocol in low responders undergoing in vitro fertilization/intracytoplasmic sperm injection. *Fertil Steril* 2009;**92**:2082–2084.
- Kim SJ, Kim TH, Park JK, Eum JH, Lee WS, Lyu SW. Effect of a dual trigger on oocyte maturation in young women with decreased ovarian reserve for the purpose of elective oocyte cryopreservation. *Clin Exp Reprod Med* 2020;**47**:306–311.
- Koichi K, Yukiko N, Shima K, Sachiko S. Efficacy of low-dose human chorionic gonadotropin (hCG) in a GnRH antagonist protocol. *J Assist Reprod Genet* 2006;**23**:223–228.
- Kolibianakis EM, Papanikolaou EG, Tournaye H, Camus M, Van Steirteghem AC, Devroey P. Triggering final oocyte maturation using different doses of human chorionic gonadotropin: a randomized pilot study in patients with polycystic ovary syndrome treated with gonadotropin-releasing hormone antagonists and

- recombinant follicle-stimulating hormone. *Fertil Steril* 2007;**88**:1382–1388.
- Kucuk T, Goktolga U, Sozen E. Efficiency of follicle-stimulating hormone, commenced in the luteal phase, for overcoming a poor response in assisted reproduction. *J Obstet Gynaecol Res* 2008;**34**:574–577.
- Kummer NE, Feinn RS, Griffin DW, Nulsen JC, Benadiva CA, Engmann LL. Predicting successful induction of oocyte maturation after gonadotropin-releasing hormone agonist (GnRHa) trigger. *Hum Reprod* 2013;**28**:152–159.
- Kwan I, Bhattacharya S, Woolner A. Monitoring of stimulated cycles in assisted reproduction (IVF and ICSI). *Cochrane Database Syst Rev* 2021;**4**:Cd005289.
- Lawrenz B, Coughlan C, Melado L, Digma S, Sibal J, Jean A, Fatemi HM. Step-down of FSH- dosage during ovarian stimulation - basic lessons to be learnt from a randomized controlled trial. *Front Endocrinol (Lausanne)* 2021;**12**:661707.
- Lim YC, Hamdan M, Maheshwari A, Cheong Y. Progesterone level in assisted reproductive technology: a systematic review and meta-analysis. *Sci Rep* 2024;**14**:30826.
- Liu C, Tian T, Lou Y, Li J, Liu P, Li R, Qiao J, Wang Y, Yang R. Live birth rate of gonadotropin-releasing hormone antagonist versus luteal phase gonadotropin-releasing hormone agonist protocol in IVF/ICSI: a systematic review and meta-analysis. *Expert Rev Mol Med* 2023a;**26**:e2.
- Liu Y, Ding F, Yang Y, Ma B. Growth hormone improves the pregnancy outcomes in poor ovarian responders undergoing in vitro fertilization: an umbrella review. *J Assist Reprod Genet* 2025;**42**:721–736.
- Liu Y, Pan Z, Wu Y, Song J, Chen J. Comparison of anti-Müllerian hormone and antral follicle count in the prediction of ovarian response: a systematic review and meta-analysis. *J Ovarian Res* 2023b;**16**:117.
- Liu Y, Wu Y, Pan Z, Jiang F, Lu Y, Meng Y. Single-dose versus multiple-dose GnRH agonist for luteal-phase support in women undergoing IVF/ICSI cycles: a network meta-analysis of randomized controlled trials. *Front Endocrinol (Lausanne)* 2022;**13**:802688.
- Liu Z, Wang KH. Effect of basal luteinizing hormone (bLH) level on in vitro fertilization/intra-cytoplasmic injections (IVF/ICSI) outcomes in polycystic ovarian syndrome (PCOS) patients. *BMC Pregnancy Childbirth* 2023;**23**:618.
- Lotfy M, Saleh MM, Elshahat AM, Elserour GA, Taha OT. Gonadotropins- letrozole, gonadotropin- clomiphene citrate, and gonadotropins only for controlled ovarian super stimulation in women with polycystic ovary syndrome undergoing intracytoplasmic sperm injection. *J Pharm Negat Results* 2022;**13**:4568–4576.
- Lou HY, Huang XY. Modified natural cycle for in vitro fertilization and embryo transfer in normal ovarian responders. *J Int Med Res* 2010;**38**:2070–2076.
- Lu X, Hong Q, Sun L, Chen Q, Fu Y, Ai A, Lyu Q, Kuang Y. Dual trigger for final oocyte maturation improves the oocyte retrieval rate of suboptimal responders to gonadotropin-releasing hormone agonist. *Fertil Steril* 2016;**106**:1356–1362.
- Luo X, Deng B, Li L, Ma R, Mai X, Wu Z. LH level on ovulation trigger day has a different impact on the outcomes of agonist and antagonist regimens during in vitro fertilization. *J Ovarian Res* 2023;**16**:26.
- Madani T, Mohammadi Yeganeh L, Ezabadi Z, Hasani F, Chehrizi M. Comparing the efficacy of urinary and recombinant hCG on oocyte/follicle ratio to trigger ovulation in women undergoing intracytoplasmic sperm injection cycles: a randomized controlled trial. *J Assist Reprod Genet* 2013;**30**:239–245.
- Madani T, Mohammadi Yeganeh L, Khodabakhshi S, Akhoond MR, Hasani F. Efficacy of low dose hCG on oocyte maturity for ovarian stimulation in poor responder women undergoing intracytoplasmic sperm injection cycle: a randomized controlled trial. *J Assist Reprod Genet* 2012;**29**:1213–1220.
- Martin JR, Mahutte NG, Arici A, Sakkas D. Impact of duration and dose of gonadotrophins on IVF outcomes. *Reprod Biomed Online* 2006;**13**:645–650.
- Martinez F, Clua E, Roca M, Garcia S, Polyzos NP. Comparison of blastocyst euploidy rates following luteal versus follicular phase stimulation in a GnRH antagonist protocol: a prospective study with repeated ovarian stimulation cycles. *Hum Reprod* 2022;**37**:2777–2786.
- Martinez F, Racca A, Rodríguez I, Polyzos NP. Ovarian stimulation for oocyte donation: a systematic review and meta-analysis. *Hum Reprod Update* 2021;**27**:673–696.
- Maslow BL, Guarnaccia M, Stefanacci C, Ramirez L, Klein JU. The use of GnRH-agonist trigger for the final maturation of oocytes in normal and low responders undergoing planned oocyte cryopreservation. *Hum Reprod* 2020;**35**:1054–1060.
- Massarotti C, Stigliani S, Gazzo I, Lambertini M, Anserini P. Long-acting gonadotropin-releasing hormone agonist trigger in fertility preservation cycles before chemotherapy. *ESMO Open* 2023;**8**:101597.
- Massin N, Abdennebi I, Porcu-Buisson G, Chevalier N, Descat E, Piétin-Vialle C, Goro S, Brussieux M, Pinto M, Pasquier M et al. The BISTIM study: a randomized controlled trial comparing dual ovarian stimulation (duostim) with two conventional ovarian stimulations in poor ovarian responders undergoing IVF. *Hum Reprod* 2023;**38**:927–937.
- Mathur RS, Akande AV, Keay SD, Hunt LP, Jenkins JM. Distinction between early and late ovarian hyperstimulation syndrome. *Fertil Steril* 2000;**73**:901–907.
- Melo M, Bellver J, Garrido N, Meseguer M, Pellicer A, Remohí J. A prospective, randomized, controlled trial comparing three different gonadotropin regimens in oocyte donors: ovarian response, in vitro fertilization outcome, and analysis of cost minimization. *Fertil Steril* 2010;**94**:958–964.
- Mochtar MH, Danhof NA, Ayeleke RO, Van der Veen F, van Wely M. Recombinant luteinizing hormone (rLH) and recombinant follicle stimulating hormone (rFSH) for ovarian stimulation in IVF/ICSI cycles. *Cochrane Database Syst Rev* 2017;**5**:Cd005070.
- Mohammadi S, Eini F, Bazarganipour F, Taghavi SA, Kutenae MA. The effect of Myo-inositol on fertility rates in poor ovarian responder in women undergoing assisted reproductive technique: a randomized clinical trial. *Reprod Biol Endocrinol* 2021;**19**:61.
- Montoya-Botero P, Drakopoulos P, González-Foruria I, Polyzos NP. Fresh and cumulative live birth rates in mild versus conventional stimulation for IVF cycles in poor ovarian responders: a systematic review and meta-analysis. *Hum Reprod Open* 2021;**2021**:hoaa066.
- Morgia F, Sbracia M, Schimberni M, Giallardo A, Piscitelli C, Giannini P, Aragona C. A controlled trial of natural cycle versus microdose gonadotropin-releasing hormone analog flare cycles in poor responders undergoing in vitro fertilization. *Fertil Steril* 2004;**81**:1542–1547.
- Mukherjee S, Sharma S, Chakravarty BN. Letrozole in a low-cost in vitro fertilization protocol in intracytoplasmic sperm injection cycles for male factor infertility: A randomized controlled trial. *J Hum Reprod Sci* 2012;**5**:170–174.
- Naik S, Lepine S, Nagels HE, Siristatidis CS, Kroon B, McDowell S. Androgens (dehydroepiandrosterone or testosterone) for women undergoing assisted reproduction. *Cochrane Database Syst Rev* 2024;**6**:Cd009749.

- Nazari L, Salehpour S, Hosseini S, Saharkhiz N, Azizi E, Hashemi T, Ghodssi-Ghassemabadi R. Effect of myo-inositol supplementation on ICSI outcomes among poor ovarian responder patients: a randomized controlled trial. *J Gynecol Obstet Hum Reprod* 2020; **49**:101698.
- Ngwenya O, Lensen SF, Vail A, Mol BWJ, Broekmans FJ, Wilkinson J. Individualised gonadotropin dose selection using markers of ovarian reserve for women undergoing in vitro fertilisation plus intracytoplasmic sperm injection (IVF/ICSI). *Cochrane Database Syst Rev* 2024;**1**:Cd012693.
- Oudendijk JF, Yarde F, Eijkemans MJ, Broekmans FJ, Broer SL. The poor responder in IVF: is the prognosis always poor?: a systematic review. *Hum Reprod Update* 2012;**18**:1–11.
- Oudshoorn SC, van Tilborg TC, Eijkemans MJC, Oosterhuis GJE, Friederich J, van Hooft MHA, van Santbrink EJP, Brinkhuis EA, Smeenk MJ, Kwee J, et al.; OPTIMIST Study Group. Individualized versus standard FSH dosing in women starting IVF/ICSI: an RCT. Part 2: The predicted hyper responder. *Hum Reprod* 2017; **32**:2506–2514.
- Pacchiarotti A, Sbracia M, Frega A, Selman H, Rinaldi L, Pacchiarotti A. Urinary hMG (Meropur) versus recombinant FSH plus recombinant LH (Pergoveris) in IVF: a multicenter, prospective, randomized controlled trial. *Fertil Steril* 2010;**94**:2467–2469.
- Papanikolaou EG, Pozzobon C, Kolibianakis EM, Camus M, Tournaye H, Fatemi HM, Van Steirteghem A, Devroey P. Incidence and prediction of ovarian hyperstimulation syndrome in women undergoing gonadotropin-releasing hormone antagonist in vitro fertilization cycles. *Fertil Steril* 2006;**85**:112–120.
- Parsanezhad M, Jahromi B, Rezaee S, Kooshesh L, Alaee S. The effect of four different gonadotropin protocols on oocyte and embryo quality and pregnancy outcomes in IVF/ICSI cycles; a randomized controlled trial. *Iran J Med Sci* 2017;**42**:57–65.
- Pereira N, Voskuilen-Gonzalez A, Hancock K, Lekovich JP, Schattman GL, Rosenwaks Z. Random-start ovarian stimulation in women desiring elective cryopreservation of oocytes. *Reprod Biomed Online* 2017;**35**:400–406.
- Popovic-Todorovic B, Santos-Ribeiro S, Drakopoulos P, De Vos M, Racca A, Mackens S, Thorrez Y, Verheyen G, Tournaye H, Quintero L et al. Predicting suboptimal oocyte yield following GnRH agonist trigger by measuring serum LH at the start of ovarian stimulation. *Hum Reprod* 2019;**34**:2027–2035.
- Qin N, Chen Q, Hong Q, Cai R, Gao H, Wang Y, Sun L, Zhang S, Guo H, Fu Y et al. Flexibility in starting ovarian stimulation at different phases of the menstrual cycle for treatment of infertile women with the use of in vitro fertilization or intracytoplasmic sperm injection. *Fertil Steril* 2016;**106**:334–341.e1. e331.
- Qin Y. Effects of using letrozole in combination with the GnRH antagonist protocol for patients with poor ovarian response: a meta-analysis. *J Gynecol Obstet Hum Reprod* 2021;**50**:102139.
- Revelli A, Gennarelli G, Sestero M, Canosa S, Carosso A, Salvagno F, Pittatore G, Filippini C, Benedetto C. A prospective randomized trial comparing corifollitropin- α late-start (day 4) versus standard administration (day 2) in expected poor, normal, and high responders undergoing controlled ovarian stimulation for IVF. *J Assist Reprod Genet* 2020;**37**:1163–1170.
- Rodgers RJ, Reid GD, Koch J, Deans R, Ledger WL, Friedlander M, Gilchrist RB, Walters KA, Abbott JA. The safety and efficacy of controlled ovarian hyperstimulation for fertility preservation in women with early breast cancer: a systematic review. *Hum Reprod* 2017;**32**:1033–1045.
- Rombauts L, Suikkari AM, MacLachlan V, Trounson AO, Healy DL. Recruitment of follicles by recombinant human follicle-stimulating hormone commencing in the luteal phase of the ovarian cycle. *Fertil Steril* 1998;**69**:665–669.
- Saharkhiz N, Salehpour S, Hosseini S, Nazari L, Sheibani S, Doohandeh T. Comparison in vitro fertilization outcomes between DouStim and minimal stimulation protocols in poor ovarian responders: a randomized clinical trial. *Int J Fertil Steril* 2024; **18**:135–139.
- Santos-Ribeiro S, Mackens S, Popovic-Todorovic B, Racca A, Polyzos NP, Van Landuyt L, Drakopoulos P, de Vos M, Tournaye H, Blockeel C. The freeze-all strategy versus agonist triggering with low-dose hCG for luteal phase support in IVF/ICSI for high responders: a randomized controlled trial. *Hum Reprod* 2020; **35**:2808–2818.
- Serafini P, Yadid I, Motta EL, Alegretti JR, Fioravanti J, Coslovsky M. Ovarian stimulation with daily late follicular phase administration of low-dose human chorionic gonadotropin for in vitro fertilization: a prospective, randomized trial. *Fertil Steril* 2006; **86**:830–838.
- Seyedoshohadaei F, Abbasi S, Rezaie M, Allahvaisi A, Jafar Rezaie M, Soufizadeh N, Rahmani K. Myo-inositol effect on pregnancy outcomes in infertile women undergoing in vitro fertilization/intracytoplasmic sperm injection: A double-blind RCT. *Int J Reprod Biomed* 2022;**20**:643–650.
- Shaltout A, Eid M, Shohayeb A. Does triggering ovulation by 5000 IU of uHCG affect ICSI outcome? *Middle East Fertil Soc J* 2006; **11**:99–103.
- Showell MG, Mackenzie-Proctor R, Jordan V, Hodgson R, Farquhar C; Cochrane Gynaecology and Fertility Group. Inositol for subfertile women with polycystic ovary syndrome. *Cochrane Database Syst Rev* 2018;**2018**:CD012378.
- Shu L, Xu Q, Meng Q, Dai X, Zhang Y, Zhou W, Yi H, Liu J, Wu C, Hou Z et al. Clinical outcomes following long GnRH α ovarian stimulation with highly purified human menopausal gonadotropin plus rFSH or rFSH in patients undergoing in vitro fertilization-embryo transfer: a multi-center randomized controlled trial. *Ann Transl Med* 2019;**7**:146.
- Siristatidis C, Stavros S, Dafopoulos K, Sergentanis T, Domali E, Drakakis P, Loutradis D. A randomized controlled trial on the efficacy and safety of low-dose hCG in a short protocol with GnRH agonist and ovarian stimulation with recombinant FSH (rFSH) during the follicular phase in infertile women undergoing ART. *Reprod Sci* 2022;**29**:497–505.
- Siristatidis CS, Basios G, Pergialiotis V, Vogiatzi P. Aspirin for in vitro fertilisation. *Cochrane Database Syst Rev* 2016;**11**:CD004832.
- Siristatidis CS, Yong LN, Maheshwari A, Ray Chaudhuri Bhatta S. Gonadotropin-releasing hormone agonist protocols for pituitary suppression in assisted reproduction. *Cochrane Database Syst Rev* 2025;**1**:Cd006919.
- Söderström-Anttila V, Foudila T, Hovatta O. A randomized comparative study of highly purified follicle stimulating hormone and human menopausal gonadotrophin for ovarian hyperstimulation in an oocyte donation programme. *Hum Reprod* 1996;**11**:1864–1870.
- Sönmezer M, Şükür YE, Ateş C, Saçınıtı KG, Sönmezer M, Aslan B, Atabekoğlu CS, Özmen B, Oktay KH. Random start ovarian stimulation before gonadotoxic therapies in women with cancer: a systematic review and meta-analysis. *Reprod Biomed Online* 2023; **47**:103337.
- Sood A, Mohiyiddeen G, Ahmad G, Fitzgerald C, Watson A, Mohiyiddeen L. Growth hormone for in vitro fertilisation (IVF). *Cochrane Database Syst Rev* 2021;**11**:CD000099.
- Steward RG, Lan L, Shah AA, Yeh JS, Price TM, Goldfarb JM, Muasher SJ. Oocyte number as a predictor for ovarian hyperstimulation syndrome and live birth: an analysis of 256,381 in vitro fertilization cycles. *Fertil Steril* 2014;**101**:967–973.
- Sun L, Ye J, Wang Y, Chen Q, Cai R, Fu Y, Tian H, Lyu Q, Lu X, Kuang Y. Elevated basal luteinizing hormone does not impair the

- outcome of human menopausal gonadotropin and medroxyprogesterone acetate treatment cycles. *Sci Rep* 2018;**8**:13835.
- Suñol J, Castillo JC, Ortiz JA, Ten J, Fuentes A, Moliner B, Martínez M, Llácer J, Guerrero J, Pitas A et al. Conventional follicular-phase ovarian stimulation vs. luteal-phase stimulation in suboptimal responders: a randomized controlled trial. *F S Rep* 2023;**4**:344–352.
- Tang H, Mourad SM, Wang A, Zhai SD, Hart RJ. Dopamine agonists for preventing ovarian hyperstimulation syndrome. *Cochrane Database Syst Rev* 2021;**4**:Cd008605.
- Tannus S, Turki R, Cohen Y, Son WY, Shavit T, Dahan MH. Reproductive outcomes after a single dose of gonadotropin-releasing hormone agonist compared with human chorionic gonadotropin for the induction of final oocyte maturation in hyper-responder women aged 35–40 years. *Fertil Steril* 2017;**107**:1323–1328.e2. e1322.
- Taronger R, Martínez-Cuenca S, Ferreros I, Rubio JM, Fernández-Colom PJ, Martínez-Triguero ML, Pellicer A. Ovarian stimulation with corifollitropin alfa followed by hp-hMG compared to hp-hMG in patients at risk of poor ovarian response undergoing ICSI: a randomized controlled trial. *Eur J Obstet Gynecol Reprod Biol* 2018;**231**:192–197.
- Tesarik J, Mendoza C. Effects of exogenous LH administration during ovarian stimulation of pituitary down-regulated young oocyte donors on oocyte yield and developmental competence. *Human Reproduction (Oxford, England)* 2002;**17**:3129–3137.
- Thuesen LL, Loft A, Egeberg AN, Smits J, Petersen JH, Andersen AN. A randomized controlled dose-response pilot study of addition of hCG to recombinant FSH during controlled ovarian stimulation for in vitro fertilization. *Hum Reprod* 2012;**27**:3074–3084.
- Tshzmachyan R, Hambartsoumian E. The role of Letrozole (LE) in controlled ovarian stimulation (COS) in patients at high risk to develop ovarian hyper stimulation syndrome (OHSS). A prospective randomized controlled pilot study. *J Gynecol Obstet Hum Reprod* 2020;**49**:101643.
- Tso LO, Costello MF, Albuquerque LET, Andriolo RB, Macedo CR. Metformin treatment before and during IVF or ICSI in women with polycystic ovary syndrome. *Cochrane Database Syst Rev* 2020;**12**:CD006105.
- Vaiarelli A, Cimadomo D, Ruffa A, Rania E, Pittana E, Gallo C, Fiorenza A, Alviggi E, Alfano S, Carmelo R et al. Oocyte competence is comparable between progestin primed ovarian stimulation with Norethisterone acetate (NETA-PPOS) and GnRH-antagonist protocols: A matched case-control study in PGT-A cycles. *Eur J Obstet Gynecol Reprod Biol* 2024;**294**:4–10.
- van der Linden M, Buckingham K, Farquhar C, Kremer JA, Metwally M. Luteal phase support for assisted reproduction cycles. *Cochrane Database Syst Rev* 2015;**2015**:CD009154.
- van Hooff MH, Alberda AT, Huisman GJ, Zeilmaker GH, Leerentveld RA. Doubling the human menopausal gonadotrophin dose in the course of an in-vitro fertilization treatment cycle in low responders: a randomized study. *Hum Reprod* 1993;**8**:369–373.
- van Wely M, Kwan I, Burt AL, Thomas J, Vail A, Van der Veen F, Al-Inany HG. Recombinant versus urinary gonadotrophin for ovarian stimulation in assisted reproductive technology cycles. *Cochrane Database Syst Rev* 2011;**2011**:CD005354.
- Venetis CA, Kolibianakis EM, Bosdou JK, Tarlatzis BC. Progesterone elevation and probability of pregnancy after IVF: a systematic review and meta-analysis of over 60 000 cycles. *Hum Reprod Update* 2013;**19**:433–457.
- Venetis CA, Storr A, Chua SJ, Mol BW, Longobardi S, Yin X, D'Hooghe T. What is the optimal GnRH antagonist protocol for ovarian stimulation during ART treatment? A systematic review and network meta-analysis. *Hum Reprod Update* 2023;**29**:307–326.
- Vermeulen N, Le Clef N, Mcheik S, D'Angelo A, Tilleman K, Veleza Z, Nelen WL. Manual for ESHRE guideline development. 2020. <https://www.eshre.eu/Guidelines-and-Legal/Guidelines/Guideline-development-process> (10 February 2026, date last accessed).
- Wang J, Ding J, Qu B, Zhang Y, Zhou Q. Does serum LH level influence IVF outcomes in women with PCOS undergoing GnRH-antagonist stimulation: a novel indicator. *J Clin Med* 2022;**11**.
- Wang Q, Wan Q, Li T, Wang X, Hu Y, Zhong Z, Pu K, Ding Y, Tang X. Effect of GnRH agonist trigger with or without low-dose hCG on reproductive outcomes for PCOS women with freeze-all strategy: a propensity score matching study. *Arch Gynecol Obstet* 2024;**309**:679–688.
- Westergaard LG, Erb K, Laursen S, Rasmussen PE, Rex S. The effect of human menopausal gonadotrophin and highly purified, urine-derived follicle stimulating hormone on the outcome of in-vitro fertilization in down-regulated normogonadotrophic women. *Hum Reprod* 1996;**11**:1209–1213.
- Wiser A, Gonen O, Ghetler Y, Shavit T, Berkovitz A, Shulman A. Monitoring stimulated cycles during in vitro fertilization treatment with ultrasound only—preliminary results. *Gynecol Endocrinol* 2012;**28**:429–431.
- Xu B, Geerts D, Yuan J, Wang M, Li Z, Lai Q, Zheng Y, Liu S, Yang S, Zhu G et al. A modified flexible GnRH antagonist protocol using antagonist early cessation and a gonadotropin step-down approach improves live birth rates in fresh cycles: a randomized controlled trial. *Hum Reprod* 2024;**39**:1969–1978.
- Yang X, Lin G, Lu G, Gong F. Letrozole supplementation during controlled ovarian stimulation in expected high responders: a pilot randomized controlled study. *Reprod Biol Endocrinol* 2019;**17**:43.
- Yoshida T, Takahashi O, Suzuki Y, Ota E, Hirata T. The effectiveness of controlled ovarian stimulation with tamoxifen for patients with estrogen-sensitive breast cancer: a systematic review and meta-analysis. *Reprod Med Biol* 2023;**22**:e12543.
- Youssef MA, Abou-Setta AM, Lam WS. Recombinant versus urinary human chorionic gonadotrophin for final oocyte maturation triggering in IVF and ICSI cycles. *Cochrane Database Syst Rev* 2016;**4**:CD003719.
- Youssef MA, Van der Veen F, Al-Inany HG, Mochtar MH, Griesinger G, Nagi Moheesen M, Aboulfoutouh I, van Wely M. Gonadotropin-releasing hormone agonist versus HCG for oocyte triggering in antagonist-assisted reproductive technology. *Cochrane Database Syst Rev* 2014;**2014**:CD008046.
- Zaat T, Zagers M, Mol F, Goddijn M, van Wely M, Mastenbroek S; Cochrane Gynaecology and Fertility Group. Fresh versus frozen embryo transfers in assisted reproduction. *Cochrane Database Syst Rev* 2021;**2**:CD011184.
- Zegers-Hochschild F, Adamson GD, Dyer S, Racowsky C, de Mouzon J, Sokol R, Rienzi L, Sunde A, Schmidt L, Cooke ID et al. The International Glossary on Infertility and Fertility Care, 2017. *Hum Reprod* 2017;**32**:1786–1801.
- Zhang LJ, Liu D, Xu LQ, Wei JY, Fan L, Zhang XQ, Liu FH. Impact of luteinizing hormone on IVF/ICSI assisted reproduction on the initiation day of gonadotropin-releasing hormone antagonist protocol. *Endocr Metab Immune Disord Drug Targets* 2024;**2**:CD011184.
- Zhang W, Liu Z, Liu M, Li J, Guan Y. Is it necessary to monitor the serum luteinizing hormone (LH) concentration on the human chorionic gonadotropin (HCG) day among young women during the follicular-phase long protocol? A retrospective cohort study. *Reprod Biol Endocrinol* 2022;**20**:24.

- Zhang Y, Liu L, Qin J, Huang H, Xue L, Wang S, Tan W. Evaluation of GnRH antagonist pretreatment before ovarian stimulation in a GnRH antagonist protocol in normal ovulatory women undergoing IVF/ICSI: a randomized controlled trial. *Reprod Biol Endocrinol* 2021;**19**:158.
- Zhou R, Dong M, Huang L, Zhu X, Wei J, Zhang Q, Liu D, Zhang X, Liu F. Association between serum LH levels on hCG trigger day and live birth rate after fresh embryo transfer with GnRH antagonist regimen in different populations. *Front Endocrinol* 2023;**14**:1191827.
- Zhu S, Lv Z, Song L, Zhang Q, Fan Y, Li J. Estradiol pretreatment in GnRH antagonist protocol for IVF/ICSI treatment. *Open Med* 2022;**17**:1811–1820.
- Zhu X, Fu Y. Randomized, controlled pilot study of low-dose human chorionic gonadotropin administration beginning from the early follicular phase for women with polycystic ovarian syndrome undergoing ovarian stimulation using the progesterone protocol. *Front Endocrinol* 2019;**10**:875.