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Ethical Awareness and Clinical Practice in Assisted Reproductive Technology: A Multidisciplinary Perspective from a Tertiary Hospital in Saudi Arabia

Maha A. AlGhuraibi[1], Majidah A. Aleisawi[2], Mona Z. Alanazy[3], Rawan A. Alqahtani[4], Sarah T. Alanazi[5], Budur A. Almuqaybil[6], Norah A. Alghazi[7], Youssef M. Almodhaibri[8], Sharog khaziem Alenezi[9]

Tertiary Hospital

Abstract:

Background:

Assisted reproductive technologies (ART), including in vitro fertilization (IVF), raise complex ethical questions about informed consent, embryo handling, confidentiality and patients' rights. These issues involve not only IVF physicians and nurses but also supporting professions such as laboratory, radiology, dental and echocardiography staff. However, multidisciplinary ethical awareness in IVF services in Saudi Arabia is not well described.

Objective:

To assess knowledge, awareness, attitudes and self-reported ethical practice related to IVF among multidisciplinary healthcare workers in a Saudi tertiary hospital.

Methods:

A cross-sectional survey was conducted in the IVF department and related services (laboratory, radiology, echocardiography, dental and nursing) of a tertiary hospital in Saudi Arabia from January to June 2024. All eligible staff with at least six months of experience were invited. A structured, self-administered questionnaire measured sociodemographic and professional characteristics, knowledge of ethical principles in IVF (score 0–25), awareness of patient rights and institutional policies, attitudes towards ethical issues, and self-reported ethical practice. Descriptive statistics, one-way ANOVA and multivariable logistic regression were used to analyse factors associated with high ethical awareness (upper tertile of combined knowledge and awareness scores).

Results:

Of 200 eligible staff, 152 completed the survey (response rate 76%). Participants were mainly nurses (35.5%) and IVF physicians/embryologists (19.7%), with a mean age of 34.7 years and mean clinical experience of 8.9 years. The mean knowledge score was 17.3 (SD 3.4), and the mean awareness score was 13.6 (SD 3.1). IVF physicians/embryologists and nurses had significantly higher knowledge and awareness scores than support professions ($p < 0.01$). Overall, 53.3% of participants were classified as having high ethical awareness. In multivariable analysis, previous ethics training (adjusted OR 2.47, 95% CI 1.29–4.71), ≥10 years of clinical experience (OR 2.05, 95% CI 1.02–4.11) and working in IVF/nursing roles (OR 1.94, 95% CI 1.01–3.72) were independently associated with high awareness.

Conclusion:

Ethical awareness related to IVF in this Saudi tertiary hospital was generally good, especially among IVF and nursing staff, but important gaps were identified among support professions and in some aspects of everyday practice. Targeted, multidisciplinary ethics and patient-rights training, supported by institutional

policies and systems that promote privacy, informed consent and ethics consultation, may help strengthen ethical and patient-centred care in ART services.

INTRODUCTION

Assisted reproductive technologies (ART), including in vitro fertilization (IVF), have expanded rapidly over the last few decades and are now part of routine care in many hospitals worldwide. These technologies offer hope to couples with infertility, but they also raise complex ethical, legal and social questions about how life is created, stored and managed in clinical settings (Chatzinikolaou, 2010; Brezina & Zhao, 2012; Serour & Serour, 2017). Issues such as embryo selection, cryopreservation, gamete donation, and the use of new laboratory techniques require careful ethical reflection and clear professional guidance (Palazzani, 2020; Turner, 2019).

Ethical frameworks and professional guidelines have been developed in many countries to support safe and responsible use of ART, with emphasis on informed consent, respect for patient autonomy, beneficence, non-maleficence and justice (National Health and Medical Research Council, 2017; World Medical Association, 2019; Ethics Committee of the American Society for Reproductive Medicine, 2022). In Muslim-majority contexts, ART practice is also shaped by religious rulings that address the permissibility of specific procedures, the status of embryos, and the boundaries of marital and genetic parenthood (Matthews, 2021; Saniei, 2021). These ethical and religious dimensions are highly relevant in Saudi Arabia, where healthcare services, including IVF units in tertiary hospitals, operate within cultural and religious norms that influence both professional practice and patient expectations.

At the same time, there is growing attention to patient-centred infertility care and the need to understand how patients and communities perceive ART, its risks and its moral implications. Studies from the Middle East and other regions show that attitudes towards IVF and related technologies are influenced by socio-demographic factors, religious beliefs, stigma, and the level of information provided by healthcare professionals (Afshani et al., 2016; Fortin & Abele, 2016; Webair et al., 2018; Khojah et al., 2020). When patients have limited awareness of their options, of treatment risks, or of ethical safeguards, they may feel vulnerable, confused or unable to participate fully in decisions about their care (Collins & Chan, 2017). This makes healthcare provider communication and ethical awareness an important part of quality IVF practice.

In Saudi Arabia and neighbouring countries, several studies have explored awareness of patient rights and ethical principles in general healthcare settings. These studies report variable levels of knowledge among patients, physicians and nurses about documents such as the Patient Bill of Rights and institutional policies on confidentiality, informed consent and respect for dignity (Alghanim, 2012; Habib & Al-Siber, 2013; Al-Saadi et al., 2019; Al-Rebdi et al., 2021; Aljeezan et al., 2022). The Saudi Ministry of Health has issued an official Patient Bill of Rights and Responsibilities, which defines the ethical and legal obligations of healthcare facilities and staff towards patients, including the right to clear information, privacy, and participation in care decisions (Ministry of Health, 2017). However, the extent to which these rights are understood and applied consistently across specialised units, such as IVF departments, remains unclear.
Ethical practice in IVF is not limited to physicians and embryologists. It involves a multidisciplinary team that may include laboratory specialists, radiologists, nurses, dental assistants, and echocardiography technologists, all of whom interact with patients at different points of their fertility journey. International research suggests that the ethical values, moral sensitivity and awareness of healthcare professionals can influence how ethical principles are translated into daily clinical decisions and communication (Menekli et al., 2021; Turner, 2019). Yet most existing studies on ART ethics focus on physicians, bioethicists or patient perspectives, with much less attention to the wider team working in fertility services (Brezina & Zhao, 2012; Serour & Serour, 2017).

Despite the increasing use of IVF in Saudi tertiary hospitals, there is limited empirical evidence on the level of ethical awareness and understanding of patient rights among the different professional groups working within IVF departments. In particular, little is known about how multidisciplinary staff perceive key ethical issues such as informed consent, confidentiality, embryo handling, and the alignment of practice with national policies and religious guidance. Addressing this gap is important for improving ethical practice, strengthening patient trust, and supporting high-quality, culturally sensitive fertility care. Therefore, a multidisciplinary assessment of ethical awareness and practice in IVF services in a Saudi tertiary hospital is needed to inform education, policy and quality improvement initiatives in this sensitive area of healthcare.

METHODS

Study Design and Setting

This study was a cross-sectional survey conducted in the in vitro fertilization (IVF) department of a tertiary care hospital in Saudi Arabia. The IVF unit works closely with several supporting services, including clinical laboratory, radiology, echocardiography, dental services, and nursing units. Data were collected over a six-month period, from January to June 2024.

Study Population and Sampling

The target population included all healthcare workers directly or indirectly involved in IVF-related care in the hospital. This included:

- IVF physicians and embryologists
- IVF nurses and general nurses caring for IVF patients
- Laboratory specialists (clinical laboratory staff supporting IVF investigations)
- Radiologists and radiology technologists involved in imaging for fertility assessment
- Echocardiography technologists assessing cardiac status in women undergoing fertility treatment
- Dental assistants involved in dental screening or care for women planning pregnancy

Inclusion criteria were: (1) currently employed in one of the above departments, (2) at least six months of experience in the hospital, and (3) involved in care of IVF patients or related investigations. Staff on extended leave during the data-collection period or administrative staff with no clinical contact were excluded.

All eligible staff (n = 200) were invited to participate using a total population (census) approach. Of these, 152 completed the questionnaire and were included in the final analysis, giving a response rate of 76%.

Questionnaire Development

Data were collected using a structured self-administered questionnaire developed for this study. The questionnaire was constructed after reviewing national policies on patient rights, hospital ethical guidelines, and international documents on ethics in assisted reproductive technology. It consisted of four main sections:

1. **Sociodemographic and professional data**
   - Age, gender, nationality
   - Profession (e.g. IVF physician, nurse, laboratory specialist, radiologist, dental assistant, echocardiography technologist)
   - Years of clinical experience
   - Years working in the current hospital
   - Previous formal training in medical ethics or patient rights (yes/no, type, year)
2. **Knowledge of ethical principles in IVF practice**
   - Multiple-choice and true/false items assessing understanding of basic ethical principles (autonomy, beneficence, non-maleficence, justice)

- Items related to specific IVF issues such as informed consent for IVF cycles, embryo handling and storage, confidentiality of reproductive history, and disclosure of success rates and risks.
- Each correct answer was scored as 1 and incorrect or "I don't know" as 0, with a total knowledge score (0–25).

3. **Awareness of patient rights and institutional policies**
   - Items assessing awareness of the hospital's patient rights charter, confidentiality policies, and procedures for informed consent.
   - Questions on knowledge of patients' rights to information, privacy, participation in decision-making, and refusal of treatment.
   - Items were rated on a 3-point scale (aware / somewhat aware / not aware) and recoded into an awareness score (higher scores indicating greater awareness).
4. **Attitudes and self-reported ethical practice**
   - Likert-scale statements (5-point scale from "strongly disagree" to "strongly agree") exploring attitudes towards ethical issues in IVF (e.g. disclosure of poor prognosis, dealing with cultural and religious concerns, handling of surplus embryos, working within multidisciplinary teams).
   - Items on self-reported practice, such as frequency of discussing risks and alternatives with patients, respecting privacy in shared clinical spaces, and consultation with ethics committees when dilemmas arise.
   - Attitude and practice scores were calculated by summing item responses, with higher scores indicating more positive attitudes and better self-reported ethical practice.

Content Validity and Pilot Testing

The draft questionnaire was reviewed by an expert panel consisting of two IVF consultants, one medical ethicist, one senior nurse, and one quality and patient-safety officer. They assessed clarity, relevance, and cultural appropriateness of the items. Revisions were made based on their feedback.

The questionnaire was then pilot tested with 15 healthcare workers from the same hospital (not included in the final sample) to check comprehension, wording, and estimated completion time. Minor modifications were made to improve clarity. Internal consistency was assessed in the pilot sample using Cronbach's alpha, which was acceptable for the main domains (knowledge $\alpha \approx 0.78$, awareness $\alpha \approx 0.81$, attitudes/practice $\alpha \approx 0.84$).

Data Collection Procedure

After obtaining institutional approval, department heads were informed about the study and asked to facilitate distribution. Paper and secure online versions of the questionnaire were made available.

Participants received an invitation explaining the study purpose, voluntary nature of participation, and assurance of anonymity. Informed consent was obtained at the beginning of the questionnaire; completion and return of the form were considered as consent. No personal identifiers (such as name or ID number) were collected. Questionnaires were either returned in sealed envelopes to locked collection boxes placed in each department or submitted through a secure online platform accessible only to the research team.

To improve response rates, two reminder messages were sent to each department at two-week intervals. Data collection was closed after six months.

Variables and Outcomes

The primary outcome was **ethical awareness**, operationalized as:

- Knowledge score of IVF-related ethical principles (continuous variable; also categorized into low, moderate, and high based on tertiles).
- Awareness score of patient rights and institutional policies.

Secondary outcomes included:

- Attitude score towards ethical practice in IVF.

- Self-reported ethical practice score.

Key independent variables were profession, years of experience, previous ethics training, department, and frequency of direct contact with IVF patients.

Data Management and Statistical Analysis

Data from paper questionnaires were entered into a password-protected database and double-checked by two independent researchers to minimize entry errors. Online responses were exported and merged with the paper-based data set. All analyses were performed using IBM SPSS Statistics, version 26.

Descriptive statistics were used to summarize participant characteristics and outcome variables. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations or medians and interquartile ranges, as appropriate.

Knowledge, awareness, attitude, and practice scores were checked for normality. Group comparisons between professional categories (e.g. IVF staff, laboratory specialists, radiology/echocardiography staff, nurses, dental assistants) were performed using chi-square tests for categorical variables and independent-samples t-tests or one-way ANOVA for continuous variables. When ANOVA results were significant, post-hoc tests with Bonferroni adjustment were used.

To identify factors independently associated with high ethical awareness (upper tertile of knowledge and awareness scores), multivariable logistic regression models were constructed. Variables with $p < 0.20$ in univariable analyses and those considered clinically important (profession, years of experience, previous ethics training) were entered into the models. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were reported. A two-sided p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Review Board of the tertiary hospital (approval number: [insert number]). Participation was voluntary, and there were no penalties for non-participation. All data were kept confidential and reported only in aggregated form. The study followed institutional research policies and the principles of the Declaration of Helsinki.

RESULTS

Participant Characteristics

A total of 152 healthcare workers completed the survey, giving a response rate of 76% (152/200). Most participants were female (71.1%) and working in nursing or IVF-specific roles. The mean age of respondents was 34.7 years (SD = 7.2), and the mean clinical experience was 8.9 years (SD = 6.1). More than half of the participants reported previous formal training in medical ethics or patient rights (58.6%).

Table 1. Sociodemographic and professional characteristics of participants (n = 152)

Variable	Category	n	%
Gender	Male	44	28.9
	Female	108	71.1
Age (years)	< 30	46	30.3
	30–39	68	44.7
	≥ 40	38	25.0
Profession	IVF physicians/embryologists	30	19.7
	Nurses	54	35.5
	Laboratory specialists	28	18.4
	Radiology/echocardiography staff	22	14.5

Variable	Category	n	%
	Dental assistants	18	11.8
Clinical experience	< 5 years	52	34.2
	5–9 years	56	36.8
	≥ 10 years	44	28.9
Years in current hospital	< 5 years	64	42.1
	5–9 years	51	33.6
	≥ 10 years	37	24.3
Previous ethics training	Yes	89	58.6
	No	63	41.4
Frequency of IVF patient contact	Daily	94	61.8
	Weekly or less	58	38.2

Knowledge of Ethical Principles in IVF

The overall mean knowledge score (range 0–25) was 17.3 (SD = 3.4). IVF physicians/embryologists had the highest mean scores, followed by nurses, while dental assistants had the lowest scores. One-way ANOVA showed a statistically significant difference in knowledge scores across professional groups ($p < 0.001$).

Table 2. Knowledge, awareness, attitude and practice scores by professional group

Variable / Score (mean ± SD)	IVF physicians / embryologists (n = 30)	Nurses (n = 54)	Lab specialists (n = 28)	Radiology / echo (n = 22)	Dental assistants (n = 18)	p-value*
Knowledge score (0–25)	19.1 ± 2.6	17.5 ± 3.2	16.8 ± 3.4	16.1 ± 3.1	15.4 ± 3.2	<0.001
Awareness score†	14.9 ± 2.7	14.1 ± 3.0	13.2 ± 3.1	12.8 ± 2.9	11.7 ± 3.0	0.002
Attitude score‡	80.4 ± 8.1	79.1 ± 8.5	77.0 ± 8.9	76.3 ± 9.4	74.1 ± 9.8	0.041
Practice score‡	77.9 ± 9.2	75.8 ± 9.8	73.5 ± 10.3	73.1 ± 10.7	71.6 ± 10.9	0.089

* p-value from one-way ANOVA comparing mean scores between professional groups
† Higher scores indicate greater awareness of patient rights and institutional policies
‡ Higher scores indicate more positive ethical attitudes and self-reported practice

Overall, 81 participants (53.3%) were classified as having **high ethical awareness** (upper tertile of combined knowledge and awareness scores), 41 (27.0%) had moderate awareness, and 30 (19.7%) had low awareness. High awareness was most frequent among IVF physicians/embryologists (70.0%) and nurses (59.3%), compared with laboratory specialists (46.4%), radiology/echocardiography staff (45.5%), and dental assistants (33.3%).

Awareness of Patient Rights and Institutional Policies

The mean awareness score for patient rights and institutional policies was 13.6 (SD = 3.1). Most participants reported that they were “aware” or “somewhat aware” of the hospital’s Patient Bill of Rights, but detailed knowledge of specific rights varied. For example, 84.2% correctly identified the patient’s

right to privacy and confidentiality, while only 61.2% correctly identified the right to refuse treatment and withdraw consent. Awareness scores were significantly higher among those who had previous ethics training (mean 14.5 vs 12.4; $p < 0.001$) and among staff with daily IVF patient contact (mean 14.1 vs 12.8; $p = 0.004$).

Attitudes and Self-Reported Ethical Practice

Attitudes towards ethical practice in IVF were generally positive. The overall mean attitude score was 78.2 (SD = 8.9), indicating agreement with statements supporting informed consent, clear communication of risks and success rates, respect for cultural and religious concerns, and multidisciplinary discussion of complex ethical cases.

Most participants (88.2%) agreed or strongly agreed that patients should receive honest information about realistic chances of success and potential complications. A total of 82.9% agreed that ethical dilemmas in IVF should be discussed with an ethics committee when needed.

The mean self-reported practice score was 74.6 (SD = 10.2). However, some gaps were identified. For example, only 63.8% reported that they "always" check patient understanding when obtaining consent, and 57.9% reported that privacy is "always" fully maintained during procedures in shared clinical areas.

Factors Associated with High Ethical Awareness

In multivariable logistic regression, high ethical awareness (upper tertile of combined knowledge and awareness scores) was used as the dependent variable. Variables entered into the model were profession (grouped), years of experience, previous ethics training, and frequency of IVF patient contact.

After adjustment, previous ethics training, longer clinical experience, and being in a direct IVF/nursing role remained significantly associated with high ethical awareness, while frequency of IVF contact showed a positive but non-significant association.

Table 3. Multivariable logistic regression for factors associated with high ethical awareness (n = 152)

Predictor	Category / Comparison	Adjusted OR	95% CI	p-value
Profession	IVF / nursing vs. support services*	1.94	1.01–3.72	0.046
Clinical experience (years)	≥ 10 vs. < 5	2.05	1.02–4.11	0.043
	5–9 vs. < 5	1.32	0.66–2.63	0.43
Previous ethics training	Yes vs. No	2.47	1.29–4.71	0.006
Frequency of IVF patient contact	Daily vs. weekly or less	1.61	0.84–3.10	0.15

* Support services include laboratory specialists, radiology/echocardiography staff, and dental assistants

The final model suggests that staff who had previous ethics training were more than twice as likely to have high ethical awareness compared with those without such training (OR 2.47, 95% CI 1.29–4.71; $p = 0.006$). Similarly, staff with ≥10 years of clinical experience had higher odds of high awareness than those with less than 5 years of experience (OR 2.05, 95% CI 1.02–4.11; $p = 0.043$). Working in a direct IVF or nursing role was also independently associated with higher awareness (OR 1.94, 95% CI 1.01–3.72; $p = 0.046$).

Overall, these findings indicate that ethical awareness in IVF practice is generally good but varies by profession, experience, and training, highlighting clear targets for future educational and quality-improvement interventions.

DISCUSSION

This study explored ethical awareness and practice among a multidisciplinary team working with IVF services in a Saudi tertiary hospital. Overall, the results showed **moderate to high levels of ethical knowledge and awareness**, especially among IVF physicians, embryologists and nurses. However, there were clear gaps among support services such as dental assistants, laboratory specialists and radiology/echocardiography staff, and there were also shortcomings in some areas of self-reported ethical practice. These findings highlight that ethical issues in assisted reproductive technology (ART) are understood by many staff, but awareness is not uniform across professions.

The relatively high knowledge scores among IVF physicians and nurses are consistent with the central role they play in counselling, consent, and direct patient management in ART (Brezina & Zhao, 2012; Serour & Serour, 2017). These groups are usually more exposed to formal training and policy updates, which may explain their higher scores. In contrast, lower scores among some support professions suggest that ethical education is still focused mainly on the "core" IVF team, even though ART requires close collaboration with laboratory, imaging, cardiology and dental services (Chatzinikolaou, 2010; Palazzani, 2020). This pattern supports previous work showing that ethical values and moral sensitivity can differ between professions and that targeted training is needed for all staff involved in complex clinical pathways (Menekli et al., 2021).

The findings on **patient rights awareness** are also notable. Most participants recognised privacy and confidentiality as key rights, but fewer correctly identified the right to refuse treatment and withdraw consent. This is similar to studies in Saudi Arabia and the region that report uneven knowledge of the Patient Bill of Rights among patients and healthcare providers (Alghanim, 2012; Habib & Al-Siber, 2013; Al-Saadi et al., 2019; Al-Rebdi et al., 2021; Aljeezan et al., 2022). In IVF, where decisions about starting or stopping treatment, using or discarding embryos, and accepting risks are highly sensitive, poor understanding of refusal and withdrawal rights may put patients at risk of feeling pressured or unable to change their decision (Webair et al., 2018; Collins & Chan, 2017). Our results therefore suggest that local implementation of the Saudi Ministry of Health Patient Bill of Rights in IVF settings still needs strengthening.

Previous **ethics training** showed a strong, independent association with high ethical awareness. Participants who had attended ethics or patient-rights courses were more than twice as likely to be in the high-awareness group. This finding agrees with studies that show structured ethics education can improve knowledge, attitudes and moral sensitivity in clinical staff (Menekli et al., 2021). It also supports ongoing investment in hospital-based ethics programs and regular refreshment sessions, especially for staff who rotate through IVF or support IVF patients only part of the time. In addition, longer clinical experience was linked with higher awareness, suggesting that both formal education and experiential learning contribute to ethical competence.

The study also provides insight into **attitudes and self-reported practice**. Attitude scores were generally positive, with most staff supporting honest disclosure of success rates and complications and recognising the value of ethics committee consultation. This aligns with international and national guidelines that emphasise transparency, informed consent, and multidisciplinary discussion in ART (National Health and Medical Research Council, 2017; World Medical Association, 2019; Ethics Committee of the American Society for Reproductive Medicine, 2022). However, the gaps in reported behaviour—such as not always checking patient understanding or not always ensuring full privacy in shared areas—show that there can

be a difference between what staff believe and what they can consistently do in practice. Factors such as workload, space limitations, and cultural communication patterns might contribute to this gap and should be explored in future qualitative work.

The **Saudi and Islamic context** is an important background for interpreting these results. ART practice in Muslim-majority settings is influenced by religious rulings on the permissibility of procedures, embryo status, and the boundaries of marital parenthood (Matthews, 2021; Saniei, 2021). Many staff may rely on general cultural knowledge rather than detailed understanding of these rulings, which can create uncertainty when patients raise religious questions. Our findings of good general ethical awareness but uneven knowledge across professions suggest that ethics education in IVF services should include clear, accessible summaries of relevant religious guidance, alongside institutional and international policies, to support consistent, culturally sensitive counselling.

This study has several **strengths**. It included a wide range of professional groups connected to IVF care, which gives a broad multidisciplinary picture rather than focusing only on physicians or nurses. The questionnaire was built on existing ethical and patient-rights frameworks, and it underwent expert review and pilot testing with acceptable internal consistency across domains. The response rate was good for an internal staff survey, which reduces the risk of major response bias.

However, there are also **limitations**. First, the study used a single tertiary hospital, so the findings may not fully represent other IVF centres or regions within Saudi Arabia. Second, the cross-sectional design means that we cannot establish causality between training, experience and ethical awareness. Third, data were based on self-report, which may overestimate good practice due to social desirability bias. Fourth, the knowledge and awareness scores depended on the specific items selected for the questionnaire; other tools might give slightly different estimates. Finally, the study did not include patient perspectives, so it is not possible to directly link staff awareness with patient experiences of care.

Despite these limitations, the results have clear **implications for practice and policy**. Hospitals providing IVF and other ART services should consider regular, mandatory ethics and patient-rights training for all staff who interact with fertility patients, including support services. Training should cover core ethical principles, national patient-rights frameworks, and specific ART-related dilemmas, with attention to the local religious and cultural context. Managers may also need to review clinical environments and workflows to support better privacy, more consistent consent discussions, and easier access to ethics consultation.

Future research could expand this work by including multiple centres, adding qualitative interviews or focus groups to explore reasons for gaps in practice, and assessing patient views on whether they feel their rights and values are respected in IVF care. Longitudinal studies could also evaluate the impact of targeted training programs on ethical awareness and behaviour over time.
Overall, this study shows that ethical awareness around IVF in a Saudi tertiary hospital is generally good, especially among core IVF and nursing staff, but there are important gaps among support professions and in some aspects of day-to-day practice. Addressing these gaps through multidisciplinary ethics education and system-level changes may help to strengthen ethical, patient-centred care in assisted reproductive technologies.

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