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## **Clinician Provision of Oncofertility Support in Cancer Patients of a Reproductive Age: A systematic review**

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## Abstract

**Objective:** The emerging discipline of oncofertility advocates for the timely provision of fertility information and referral for fertility preservation to all cancer patients of reproductive age (<45 years). A systematic review was undertaken on the clinician provision of oncofertility support to determine whether cancer patients are having their support needs adequately met by staff.

**Methods:** An initial search conducted in May 2016 identified 351 potentially relevant studies. The papers were divided into two categories; papers on the clinician provision of oncofertility support were reviewed for this study and papers on patient oncofertility support needs were reviewed for a separate systematic review.

**Results:** A total of 23 studies were included within the final review of this manuscript. Although many clinicians are broadly informed about the risk to their patients' fertility brought about by cancer treatment, there are many factors which hinder the appropriate discussion, referral or service utilisation needed in order to provide adequate oncofertility support to patients of reproductive age.

**Conclusions:** Oncofertility support is often not delivered to the standard of current guidelines, with many clinicians not providing the recommended care to all eligible patients, and as such many patients may lack the oncofertility support that they require. The implementation of a clear procedural process would assist clinicians in the provision of oncofertility support for cancer patients of reproductive age.

**Key words:** Oncology, Cancer, Support, Fertility, Fertility Preservation, Oncofertility, Health Service Practices

**Word Count:** 5,971

Author

## Background

Cancer and cancer treatment, either temporarily or permanently, affect the fertility potential of between 50-75% of cancer survivors.<sup>1</sup> Infertility and sexual dysfunction brought about by cancer treatment has significant effects to fertility-related psychological health and the quality of life for cancer patients.<sup>2-5</sup> Current treatment guidelines advocate for all cancer patients of reproductive age to be informed of the impact of cancer treatment on their fertility in a timely manner, alongside the referral to fertility specialist services<sup>6-11</sup> to reduce significant later life impacts and meet the support needs of cancer patients and survivors. Further, there is a growing consensus that fertility should be discussed with all cancer patients at the time of diagnosis, prior to commencing cancer treatment.<sup>12-14</sup> In addition, in order to allow these cancer patients the opportunity to have a biological child in the future, patients should have the opportunity to undertake fertility preservation.<sup>15</sup> Despite best practice recommendations, there are a number of barriers in providing oncofertility (fertility and oncological care) services<sup>16</sup> and most centres do not have clear models of care ensuring that all patients have access.<sup>17</sup>

A systematic review undertaken by this author group identified cancer patients of reproductive age (14-45 years) report unmet oncofertility support needs.<sup>18</sup> Findings indicated that unmet information needs were documented in up to half of young cancer patients, there was a lack of consistency across studies in the availability and referral practices of fertility preservation, and young female patients often reported greater barriers towards receiving appropriate oncofertility support. Moreover, clinician-patient interactions were often viewed as inadequate and did not place importance on discussing fertility to the level that young patients desired. It is concerning that half of young, reproductive-aged, adult cancer patients do not recall their cancer clinician discussing fertility<sup>19</sup> and cancer survivors recall low rates fertility preservation uptake.<sup>20</sup>

It is important that clinicians are able to accurately determine and meet the nuanced oncofertility needs of cancer patients within reproductive age, including a young adult cancer population,<sup>21</sup> and are able to respond to individual patient need. Cancer patients hold

concerns regarding their fertility throughout the whole cancer journey, from diagnosis, throughout treatment and into survivorship,<sup>22-24</sup> and at each of these time points their concerns and consequent care needs may change depending on patient age<sup>25</sup>, gender<sup>26</sup> or child bearing status.<sup>27</sup> Moreover, as young adult cancer patients rate both fertility information<sup>28</sup> and post-treatment fertility<sup>26</sup> to be of high importance, a better understanding of services offered by clinicians and rates of referral for oncofertility support is warranted to assure that patients' support needs are met across the whole reproductive age.

An increase in oncofertility awareness and clinical practice recommendations<sup>29</sup> has resulted in a growing body of literature detailing clinician provision of services<sup>30,31</sup> and engagement with care.<sup>32,33</sup> This literature has not yet been reviewed. The aim of the current study is therefore to systematically review the literature on the clinician provision of oncofertility support; including clinician discussions, referral practices, and rates of oncofertility service, which are offered to paediatric and young adult cancer patients of reproductive age (< 45 years). This review will allow for a determination of whether current practices align with best practice models of care,<sup>6-11</sup> and assess whether cancer clinicians are meeting the oncofertility support needs of cancer patients of reproductive age.

### **Method**

#### **Literature Search**

This systematic review considered all studies where provision of oncofertility support were a primary focus, reported from the clinician perspective. No restrictions were made on clinician type, with all cancer specialists and health care professionals reporting on the fertility support offered to cancer patients of a reproductive age (<45 years) included. It was important not to exclude a paediatric sample as this would also potentially exclude clinicians who offer oncofertility support to adolescent and young adult patients (AYA) who fall within reproductive age. However, paediatric cancer patients were not a primary focus of this review. Studies were also included when they reported on the outcome of a fertility service intervention and detailed rates of fertility preservation or provision of information.

A comprehensive literature search was performed in May 2016 with suitable studies identified through the searching of electronic databases Medline, EMBASE, PSYCH Info, Web of Science and SCOPUS, alongside the screening of relevant reference lists. Search terms were tailored to individual databases in order to map search terms to database subject headings and take an inclusive approach (see Table 1 for an inclusive list). The literature search, identified 351 potentially relevant studies after the deletion of duplicates (see Figure 1 for inclusion/exclusion flowchart). All titles and abstracts were screened by a single reviewer. To ensure inter-rater reliability two reviewers full text reviewed the remaining 85 studies to determine eligibility for inclusion. Discrepancies between ratings of inclusion on five studies were discussed between two reviewers until a consensus was reached. A total of 23 studies were included for further analysis.

### **Quality Analysis and Extraction**

The quality of final studies was assessed using the Mixed Methods Appraisal Tool (MMAT),<sup>34</sup> a valid instrument for testing mixed method reviews<sup>35</sup> utilised worldwide.<sup>36,37</sup> Scores on the MMAT vary from 25% (one criteria met) to 100% (all criteria met) with quality assessed according to criteria related to either qualitative or quantitative enquiry. All studies were of high quality (75-100%). Data was extracted from each individual paper (see online supplementary Table 2 for full data extraction by study) on clinicians' provision of oncofertility discussions, referral practices and patient service utilisation. Factors that prohibit oncofertility support are detailed in Table 3.

## **Results**

### **Study Characteristics**

Of the 23 studies included, 16 were quantitative, six were qualitative utilising discourse, content and thematic analyses, and one study utilised mixed methods. The studies were published between 2007 and 2016, conducted across seven countries and clinicians represented a range of disciplines treating paediatric cancer patients or cancer patients of reproductive age. Three studies reported on outcomes of patient fertility interventions.<sup>38-40</sup>

## **Oncofertility Discussions**

Eight studies reported on the importance of fertility.<sup>17,41-47</sup> Clinicians reported an ethical importance and duty of care to inform all patients of the impact to their fertility<sup>41,43</sup> and to offer cryopreservation.<sup>43</sup> Fertility was reported to be an essential part of patient discussions,<sup>17</sup> rated as 'very important' by the majority of doctors, nurses and AHPs.<sup>17</sup> Clinicians also perceived fertility preservation to be very important.<sup>42,45,46</sup> Providing information about infertility and fertility preservation options was considered to be important for 81% of clinicians, with 96% considering quality of life after gonadotoxic treatment to be important, and 59% considering infertility after malignancy to be important.<sup>44</sup> Partner status, younger age and female status of the clinician were associated with more positive attitude toward fertility issues in breast cancer patients.<sup>47</sup>

Five studies reported on clinicians' awareness of patient fertility factors or concerns.<sup>17,42,43,47,48</sup> Almost all clinicians (>90%) were aware of the potential for early menopause, delayed puberty and risk of certain cancer treatments on future patient fertility.<sup>47</sup> Health care professionals were aware of patient fertility concerns, such as the impact of treatment on fertility, decision-making, the choice to have future children, infertility, capacity to care for future children, early menopause, having accurate fertility preservation information, feelings of guilt and decisional conflict.<sup>17</sup> Clinicians acknowledged fertility concerns were an unmet need for many patients, a neglected area of clinical focus, and that minority groups have differing fertility needs; through an increased importance on fertility (cultural and ethnic minority groups) or lack of available resources (LGBTQI patients).<sup>17</sup> Clinicians recognised that fertility status was a major concern for patients, described as being 'devastating' for patients<sup>48</sup> and reported infertility was a major impact to patient's future quality of life.<sup>43</sup> Clinicians reported that female patients in particular will worry and feel guilty after changes to fertility,<sup>48</sup> with clinicians reporting that female patients tend to show more distress and anxiety or consider fertility to be a top priority, compared to male patients.<sup>17</sup> Clinicians also held the belief that adolescent and young adult patients desire fertility preservation information.<sup>42</sup>

Four studies reported on clinicians' use of written materials when informing patients of fertility or fertility preservation.<sup>17,49-51</sup> Half of physicians and advanced practice nurses reported using fertility educational materials 'usually' to 'always'; however, the adult language, adult content and overall reading level was a shortcoming of this material when supplied to young patients of reproductive age.<sup>49</sup> A second study reported that only 13.6% of oncologists 'always' to 'often' give patients educational materials about fertility preservation, while the majority (60.2%) reported 'rarely' to 'never' providing written materials.<sup>51</sup> Some health care professionals reported asking patients if they wanted additional, more specific or written information, or to speak with someone else;<sup>17</sup> however, most clinicians preferred face-to-face over written information.<sup>50</sup>

Oncologists were considered most likely (46%) to inform patients of risks to fertility,<sup>41</sup> while doctors and nurses were more likely to 'always' address fertility compared to allied health professionals.<sup>17</sup> Only half of clinicians reported 'always' and a third reported 'most of the time' discussing the risk of treatment-induced infertility; with 68% of clinical nurse specialists, 55% clinical oncologists, 53% fertility specialists, 52% medical oncologists and 40% surgeons reporting being involved in discussions.<sup>52</sup> Ninety-three percent of clinicians reported routinely discussing the impact on fertility with patients and families, 63% reported discussing fertility with all at risk patients and 74% informed patients when treatment would not impact fertility.<sup>53</sup> However, when rates of fertility patient discussions were assessed via medical records, the impact of treatment on fertility was discussed with only 63% of patients.<sup>54</sup>

Three studies reported on the way in which fertility discussions were undertaken by clinicians.<sup>41,47,55</sup> Female or medical oncologists were more likely to tailor patient discussions according to patient parity, partner status and economic status when discussing fertility. However, 21% of clinicians reported that patients independently raise fertility concerns and thus commence the fertility discussion.<sup>47</sup> Doctors were more likely to address fertility at the initial consultation, prior to cancer treatment, as part of standard practice, compared to nurses and allied health professionals; while the transplant team or clinical psychologist supported patients with fertility issues post treatment.<sup>55</sup> Within a sample of 30 cancer centres, some

institutions (number not reported) had a process of using specialists to provide information; the oncologist would ideally inform the patient about potential infertility and fertility preservation and this would be followed by an in depth discussion with a reproductive and infertility expert.<sup>41</sup> However, fertility discussions focused on practical rather than emotional issues<sup>55</sup> and the extent and quality of discussions was not clear.<sup>41</sup>

Four studies reported on fertility discussions with children and adolescent patients specifically.<sup>43,48,49,53</sup> All clinicians felt that children should participate in the decision making process, that younger patients need information about fertility at the start of treatment; however, clinicians will talk to parents first.<sup>43,48</sup> The majority of clinicians (87%) believe children of any age should be involved in the discussion.<sup>53</sup> Clinicians will always discuss fertility with an adolescent, even when parents show doubt or when parents refuse to give permission, and sometimes clinicians talk to adolescents alone without parent's knowledge.<sup>43</sup> Almost all physicians (93%), advanced practice nurses (75%) and half of nurses (48%) reported discussing the impact of cancer treatment on future fertility with adolescent male patients 'usually' to 'always'.<sup>49</sup>

Half of clinicians reported 'always' discussing fertility preservation.<sup>46</sup> However, fertility preservation options were discussed with only 18% of paediatric oncology patients, 30% of which were at high risk of infertility, and significantly more were male (67%).<sup>54</sup> Most physicians, advanced practice nurses and nurses reported being 'somewhat' - 'entirely comfortable' with fertility preservation discussions,<sup>49</sup> with only 3% of clinicians reportedly being uncomfortable discussing fertility preservation.<sup>50</sup> Almost all oncologists and haematologists agreed it is the role of clinician to discuss sperm banking at diagnosis and only 2% would rely on patients to raise the topic. Fertility preservation techniques that were discussed included; electro-ejaculation, epididymal aspiration (boys), oophoropexy, ovarian tissue cryopreservation, oocyte cryopreservation, embryo cryopreservation, hormone protection (in women).<sup>54</sup> However, a systematic process of recording discussions about fertility preservation was often absent.<sup>50</sup>

### **Referral Practices and Utilisation**

Five studies reported on referral practices for fertility preservation between 2011-2013.<sup>41,44,50,52,55</sup> Doctors and ward nurses made referrals prior to cancer treatment<sup>55</sup> and almost half of clinicians (42%) would offer sperm banking post treatment.<sup>50</sup> In one study only 61% of clinicians were aware of an established referral pathway to a local fertility unit for fertility preservation.<sup>52</sup> While a second study reported that although half of clinicians referred some patients to a fertility specialist, if referral options were standardised (by way of a protocol or guideline) 43% would offer all patients fertility preservation.<sup>44</sup> A third study also indicated that a standardised referral process would be helpful in aiding referrals, as it would also serve as a reminder to oncologists of fertility preservation services available.<sup>41</sup>

Seven studies reported on facilitators for referral to fertility services between 2009-2014.<sup>44,45,47,50,53,56,57</sup> Less than half of oncologists (42-47%) regularly refer patients to a reproductive specialist when the patient expresses concern about their fertility, with.<sup>47,57</sup> Across studies, higher rates of referral to a fertility service were associated with positive clinician attitude toward fertility preservation, patients asking about fertility, an onsite fertility centre, diagnosis type, patient age (with patients aged 20-29 years referred most frequently), male patient gender and post-pubertal status.<sup>47,50,54,56,57</sup>

Eight studies (2011-2015) reported on the availability and utilisation of fertility preservation services.<sup>41,44,46,47,52,55,56,58</sup> The majority of clinicians report fertility services being available onsite,<sup>41,46</sup> however, at times sperm banking is available but female fertility preservation is not.<sup>55</sup> Although ovarian transportation, cryopreservation of embryos, ovarian tissue and vitrification of oocytes was offered to 78% of female patients,<sup>56</sup> only 29% of reproductive specialists accept single female patients for oocyte cryopreservation.<sup>58</sup> Clinicians stated that 59% of female patients who were offered fertility preservation utilised this service, with patients who were offered preservation in more recent years more likely to proceed, and cryopreservation of embryos the most common option.<sup>56</sup> Half of clinicians report the use of GnRH agonists for fertility preservation in standard practice, with surgeons and clinical nurse specialists more likely to be aware of this fertility option.<sup>52</sup> Ovarian transportation was offered significantly more by gynaecologists and radiotherapists than other disciplines in a sample of clinicians where 62% took action to preserve ovarian function.<sup>44</sup> A quarter of

clinicians also consulted a reproductive specialist when they encountered fertility problems in their patients.<sup>47</sup>

Three studies (2011-2012) reported on practices or pathways assisting service utilisation.<sup>40,41,59</sup> Clinicians identified a suitable pathway toward patients' utilisation of fertility services involved: (1) clinician discussed fertility, (2) information provided, and (3) referral to a fertility specialist.<sup>41</sup> A second study found that the implementation of a 12 month standardised fertility process in 2009 resulted in 90% of patients being offered sperm banking; an eight-fold increase in the proportion of adolescent and young adult patients and five-fold increase in rate of sperm banking overall.<sup>40</sup> A pilot study of a patient information brochure and referral system administered in a 12 month period (Aug 2007-Aug 2008) across eight clinics found a nine-fold increase in calls and consults to a reproductive/ endocrinology infertility specialist.<sup>59</sup> While an intervention study also found that those clinicians who viewed the Banking on Fatherhood (BOF) educative tool scored significantly higher on a knowledge test.<sup>39</sup>

Referrals and utilisation of fertility preservation counselling was reported in three studies (2010-2014).<sup>38,46,56</sup> Although 90% of oncologists believe patients would benefit from a referral to a specialist for counselling, 86% do not refer.<sup>46</sup> The majority of fertility counselling referrals came from a physician (46%), followed by surgeon (27%) and oncologic gynaecologist (14%).<sup>56</sup> An analysis of fertility preservation counselling indicated that rates of utilisation have increased between January 2001 and December 2013, with an increase in 2006 and again in 2010-2013.<sup>56</sup> In more recent years patients were younger, more frequently lacked a stable partner and more often had a low risk of ovarian failure.<sup>56</sup> An intervention also found that after 23 single counselling sessions were provided to 18 couples and 5 single women, 87% chose to undergo fertility preservation with 19 assisted reproductive cycles initiated.<sup>38</sup>

A large number of clinicians were also interested in receiving specific training about discussing fertility and sperm banking,<sup>50</sup> or desired further information about fertility preservation, referral services, supports or costs.<sup>17</sup> Nurses and allied health professionals were

more likely to desire further training than doctors.<sup>17</sup> Almost all clinicians (83%) reporting formal training on fertility preservation,<sup>49</sup> or a clear referral pathway would be beneficial<sup>41</sup> and would welcome a guideline for discussing fertility preservation in routine practice.<sup>45</sup>

### Discussion

The purpose of the current study was to systematically review the literature on the clinician provision of oncofertility support for their paediatric and young adult cancer patients of reproductive age (< 45 years). Data was extracted from all studies on fertility patient discussions and provision of information, fertility service referral practices and utilisation, and barriers to the provision of oncofertility support.

International and national guidelines advocate for all cancer health care providers to engage in fertility discussions with newly diagnosed cancer patients of reproductive age, and that these discussions should be guided by institutional policies and practices.<sup>6-9,11</sup> Although the majority of clinicians report routinely discussing fertility with cancer patients of reproductive age,<sup>53</sup> recorded rates of fertility discussions are significantly lower;<sup>54</sup> negatively impacted by factors such as heightened level of patient risk,<sup>53,54</sup> clinician type,<sup>17,52</sup> patient pubertal status<sup>49</sup> or patient female gender status.<sup>17,54</sup> Moreover, the extent or quality of these discussions was often unclear,<sup>41</sup> lacked a systematic process for being recorded<sup>50</sup> and the focus of discussions was on practical rather than emotional issues.<sup>43</sup> In addition, despite guidelines advocating for the provision of written fertility information to assist fertility discussions,<sup>8</sup> the majority of oncologists rarely offer this material to patients<sup>51</sup> and the information that is provided is often not age appropriate.<sup>49</sup>

The discussion of fertility preservation options as early as possible to all patients of reproductive age is also recommended by international and national guidelines, with likely risks and gender appropriate options for preservation clearly stated.<sup>6,8,9</sup> However, results of the current review indicate that in some cases, only half of clinicians always discuss fertility preservation,<sup>46</sup> and recorded rates of fertility preservation discussions indicate that discussions may only be completed with 18% of patients.<sup>54</sup> Likelihood of discussions were influenced by a number of patient<sup>42,45,46,52</sup> and clinician factors.<sup>42,45</sup> Although the gender

specific options for fertility preservation that were discussed were consistent with recommended treatment procedures,<sup>54,56</sup> the lack of knowledge by health care professionals<sup>17,41</sup> likely indicates a deficit in institutional policy and practice procedure guidelines to assist health care professionals with these discussions.

Less than half of clinicians refer their patients to a reproductive specialist when the patient expresses fertility concerns.<sup>47</sup> This finding is in direct contradiction to current guidelines, which state that a prompt referral to a fertility specialist should be made for those patients who express an interest or desire for further oncofertility support.<sup>9</sup> Rates of referral for fertility preservation were negatively impacted by patient factors such as pre-pubertal status, female gender,<sup>45,53,54</sup> diagnosis type, poor prognosis and patient age (younger than 20 or greater than 50 years).<sup>50,56</sup> Clinicians stated that it was both difficult to determine whether patients required fertility preservation or to find appropriate services for those in need.<sup>41,53</sup> There was a reported need for a standardised referral pathway to facilitate a higher referral rate,<sup>41,44</sup> with the implementation of a referral process shown to increase patient utilisation.<sup>59</sup> Similarly, despite guidelines advocating for the referral to fertility counselling or the provision of additional psychological support<sup>6,8,9</sup> up to 84% of clinicians do not refer patients for counselling, despite 90% believing that patients would benefit from this referral.<sup>46</sup> The implementation of a clear fertility referral pathway is therefore likely to be beneficial for both clinicians and patients in the provision of oncofertility support.

Results indicate that in recent years there has been an increase in service utilisation for both fertility preservation and fertility counselling,<sup>56</sup> with preservation procedures offered consistent with recommended treatment approaches.<sup>44,52</sup> Provision of service interventions have also proved successful for both male and female patients in increasing rates of fertility counselling and preservation utilisation.<sup>38,40</sup> However, results also indicate that the lack of availability of onsite services hinders rates of utilisation for both male and female patients<sup>41,46,55</sup> while lack of referral pathways, cost, clinician knowledge or access to specialists who could undertake necessary preservation procedures also act as barriers toward utilisation.<sup>17,42,44,58</sup>

Consistent with patient reported perspectives of oncofertility support needs, reported in our previous systematic review,<sup>18</sup> clinicians agreed that fertility was important to cancer patients of reproductive age,<sup>42,45,46</sup> that cancer patients desired fertility information,<sup>42</sup> and that impaired fertility was a major concern for patients.<sup>17,48</sup> However, results also show that many clinicians hold negative attitudes or beliefs about the importance of fertility for their patients, alongside inaccurate information about fertility preservation procedures or lack of available resources to implement necessary care.<sup>41,42,53,58</sup> Thus indicating that many patients are at risk of receiving inadequate oncofertility support. The inconsistency between these findings also highlights the need for a worldwide consensus on the appropriate provision of oncofertility support to ensure all cancer patients of reproductive age are adequately supported.

### **Clinical Implications**

To the authors knowledge no systematic review has been undertaken that investigates current literature on the clinician provision of oncofertility support. This synthesis has afforded an indication of whether current clinical practices align with the international and national recommended guidelines published within the United States, Europe and Australia; that are reflective of practices seen across international Western medical settings. Results indicate that oftentimes these recommended guidelines are not met, with patients not adequately informed of the potential for future fertility difficulties, low referral rates to reproductive specialists and lack of available oncofertility services. This review serves to highlight that additional care must be taken by clinicians in supporting cancer patients of reproductive age with their oncofertility needs, in order to ensure best practice guidelines are met.

Results indicated that clinicians were at times unsure whose role it was to provide oncofertility support, with a desire for a standardised pathway and procedure to assist in the provision of oncofertility care.<sup>17</sup> Current guidelines do not stipulate whose role it is to provide oncofertility care.<sup>8,9</sup> There is therefore confusion as to whose role it is to provide this support when oncological care is facilitated by a multi-disciplinary team.<sup>17,50</sup> Future research is needed to assist in this clarification, through the implementation of a suitable pathway for oncofertility support, inclusive of clinician roles. As such, this synthesis will also be used to

guide a competency framework with an international working body to ensure that a global competency framework can be developed. This competency framework will provide clear recommendations for oncofertility support that can be used by clinicians to guide oncofertility discussions, referrals and service utilisation when working across a multi-disciplinary team.

An additional barrier identified within this review, which may prohibit clinicians in adequately addressing their cancer patients' oncofertility support needs, was low clinician knowledge and training; with varying degrees of oncofertility knowledge seen across clinician types.<sup>45,49,52</sup>

Results indicated that many clinicians were unaware of fertility preservation options or appropriate facilities,<sup>42,46,47</sup> and lack of appropriate fertility knowledge was shown to hinder fertility discussions<sup>17,41,45,52</sup> and service utilisation.<sup>44,56,58</sup> Due to these deficits, many clinicians were interested in training specialising in oncofertility.<sup>17,49,50</sup> This review may therefore be used to advocate for additional training within hospital settings in the provision of oncofertility care, with particular focus on; current recommended guidelines in oncofertility care for patients of reproductive age, how to engage in patient oncofertility discussions, when referrals to reproductive specialists are recommended and how to engage with reproductive services to ensure optimum chance of fertility preservation being undertaken prior to oncological treatment.

### **Study Limitations**

This review has reported on the provision of oncofertility support and care from the clinician perspective. However, due to its reliance on retrospective recollections by clinicians, this review is limited in its ability to accurately determine the exact rates and quality of the provision of care. Currently, there is limited research which indicates quantitative rates of service provision, through the documentation of medical records or outcomes of service interventions. Similarly, some research has also suggested a deficit in reporting the extent and nature of discussions, such that the quality of fertility discussions is hard to measure.<sup>41</sup> Discrepancies between recorded rates of fertility discussions<sup>54</sup> and clinicians' perspectives indicate that some of this data is influenced by reporting bias. As such, caution should be

taken in interpreting the results to reflect rates of care currently offered to patients, but rather forms a reflection of provision of oncofertility support from the clinician viewpoint.

It is somewhat problematic to group research on oncofertility support and care from 2007 to the current date, given that during this time there have been vast improvements in oncofertility treatment approaches, the development of oncofertility services and recommended fertility preservation procedures across paediatric and adult cancer patients. What the results do reflect however, is that in more recent years, fertility discussions and the provisions of services have improved, and that interventions in this area have also proved beneficial; thus reflecting oncofertility is a growing area of importance for clinicians and cancer patients of reproductive age.

Given the diverse range of countries included in this review it is also likely that results represent diversity in clinical practices and available resources in caring for patient's oncofertility. Despite this, the vast majority of studies reported within the results are reflective of Western medical practices, and encompassed by the leading recommended guidelines within the United States, Europe or Australia.<sup>60</sup> In order to ensure a consistent international perspective in the clinical practice and the provision of oncofertility services, the findings of this review will be utilised to guide a global competency framework, which would ensure that there is consistency on an international scale in offering patients oncofertility support.

It was important to include cancer clinicians who address a paediatric population, as these clinicians are also likely to treat a younger reproductive sample of adolescent patients. However, it must be noted that paediatric, adolescent and adult cancer patients will report different oncofertility needs, are able to access only certain fertility preservation services dependent on pubertal status, and have a diverse range of cancer types which are treated in different ways. As such this review is limited in its ability to draw out these clinician and patient nuances within the results. However, as all the recommended guidelines for the provision of oncofertility support do not stipulate between cancer types but by the risk of treatment modalities, and adolescent and young adult (AYA) recommendations are consistent

with those of a later reproductive age,<sup>8</sup> this synthesis does not alter the results being able to indicate a discrepancy between the recommended guidelines and reported provision of support.

### **Conclusion**

Taken together with our previous work on patient oncofertility support needs, the findings of this review indicate that although many clinicians are broadly informed about the risk to their patients' fertility brought about by cancer treatment, there are many factors which hinder the appropriate discussion, referral or service utilisation needed in order to provide adequate oncofertility support to patients of reproductive age. These findings highlight that the provision of oncofertility support is often not delivered to the standard of current guidelines, with many clinicians not providing the recommended care to all eligible patients, and as such many patients may lack the support that they require.<sup>18</sup>

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**Table 1:** Search Terms Utilised across All Electronic Databases

Cancer	Fertility	Health Service	Patient-Clinician Interactions
Neoplasm*/ or oncology / or cancer survivor/ or cancer survival/ or childhood cancer	Fertility/ or infertility, female/ or infertility, male/ or reproduction/ or reproductive health/ or reproductive physiological phenomena/ or reproductive techniques/ or fertility preservation/ or sexual reproduction	Health service*/ or Health knowledge, attitudes, practice/ or health care utilization/ or attitude to health/ or health services research/ or health service needs/ or health care delivery	Professional-patient relations/ or doctor patient relation/ or patient satisfaction/ or client satisfaction/ or patient care management/ or quality health care/ or health care quality, access and evaluation

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**Table 3:** Factors that prohibit oncofertility support across oncofertility discussions and service utilisation.

Area of Oncofertility Support	Type of Factor	Barriers and Factors Prohibiting Oncofertility Support
Discussions	Patient	<ul style="list-style-type: none"> <li>- Fertility less likely to be discussed with patients, while FP less likely to be discussed with female patients.<sup>17</sup></li> <li>- Pre-pubertal status or being ‘too young’, patient not at significant risk of infertility, patient too ill, severe symptoms or poor prognosis, time constraints of high risk of disease recurrence linked to lower fertility discussions.<sup>17,47,54</sup></li> <li>- Parity, patient age, partner status, chances of FP being a success or compromising cancer treatment, concern about delays to treatment or time constraints, cancer status, and/ or oestrogen receptor expression, concern about wellbeing of future children and cultural or religious differences hinder FP discussions.<sup>45,52</sup></li> <li>- Clinicians reported patient resistance to discussing fertility when the patients were overwhelmed<sup>41</sup></li> <li>- Embarrassment of parents, adolescent and young adult male patients in discussing FP was noted.<sup>17,42</sup> Difficulty in discussing fertility with young male patients who had no current desire for parenthood.<sup>17</sup></li> </ul>
	Clinician	<ul style="list-style-type: none"> <li>- Lack of specialists, poor access, knowledge, confidence or resources prohibit fertility discussions<sup>17,47,54</sup></li> <li>- Speciality in surgery, orthopaedic oncology or radiology, larger practice size and being unaware of guidelines was associated with greater odds of ‘rarely/never’ providing written materials.<sup>51</sup></li> <li><b>Knowledge:</b> Clinician knowledge influenced FP discussions,<sup>45,52</sup> with only 64% of oncologists having ‘accurate’ fertility knowledge, and accuracy of knowledge associated with number of patients treated, presence of children, age of physician and presence of a female colleague.<sup>47</sup></li> <li>- Clinician type influenced level of knowledge, with gynaecologic oncologists and breast program clinicians reporting highest knowledge.<sup>45</sup></li> <li><b>Attitudes:</b> Doctors reported that fertility discussions should be confined to specialists as knowledge was outside their area of expertise,<sup>17</sup> while a subsample of surgeons felt the responsibility for discussing preservation fell on the clinician who administered treatment that may impact fertility.<sup>45</sup></li> <li>- Most clinicians reported that FP was not perceived to be a high priority for patients, rather it was of medium-low priority to be discussed at diagnosis, with time and lack of knowledge of options or resources barriers to discussion.<sup>45</sup> As such, FP was often put on the ‘backburner’ due to the shock of diagnosis.<sup>42</sup></li> <li>- Almost half of clinicians in one study reported that cancer is more important than childbirth, even when the patient is cancer free five years post treatment.<sup>58</sup></li> <li>- Clinicians reported feeling awkward regarding lack of resources, establishing trust with patients and not excluding parents, which hindered fertility discussions.<sup>42</sup></li> </ul>

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		- Older research (2007) indicates clinicians reported routinely not having discussions with women as they believed there to be limited options and resources in the community, and that FP options were not feasible. <sup>45</sup>
	<b>Institutional</b>	- Time constraints of the clinic, no funding or facilities, or unproven FP techniques hinder discussions <sup>17,47,54</sup> - Most clinicians had no formal training regarding discussing or referring for FP <sup>45,49</sup>
<b>Service Utilisation</b>	<b>Patient</b>	- The inability to delay treatment hindered referring female patients for FP. <sup>45</sup> - Poor prognosis, > 50 years, prior treatment and urgency to commence cancer treatment were all related to lower likelihood of referral in male patients. <sup>50</sup> - The most important reason not to offer fertility preservation were concerns regarding the disease (e.g. poor prognosis or needing to commence treatment: 62%). <sup>44</sup> -The majority of clinicians (84%) take patients ability to pay into account when considering a referral. <sup>50</sup>
	<b>Clinician</b>	- No designated person for fertility preservation hindered utilisation. <sup>41,46</sup> - Significantly more oncologists reported being influenced by fertility bound factors (e.g. cost, availability, knowledge about other options) compared to radiotherapists, haematologists or gynaecologists. <sup>44</sup> <b>Knowledge:</b> Majority of clinicians report little to no knowledge of resources, technology, referral or preservation options, specialists, or costs associated with FP, <sup>45</sup> with significant variation between knowledge of available funding for FP at public versus private fertility units. <sup>52</sup> - Higher patient volumes and seniority were linked to lower knowledge: unaware of fertility preservation techniques or places to refer, <sup>45</sup> while junior doctors were less likely to know about provision of FP. <sup>52</sup> - Restricted knowledge of referral pathways and being less likely to initiate fertility discussions linked to lower referrals. <sup>56</sup> - Difficulty determining if patients needed FP services, with oncologists failing to provide referrals for patients at risk. <sup>41</sup> - Clinicians unaware of current guidelines, <sup>45</sup> with one quarter (26%) of physicians were unfamiliar with current guidelines for FP, compared to 36% of advanced practice nurses and 65% of nurses. <sup>49</sup> - Only half of clinicians knew local policy relating to provision of sperm banking <sup>50</sup> and only 30% of clinicians were aware of sperm banking facilities. <sup>42</sup> - Half of clinicians were also not aware of female FP options or if fertility preservation was available at their institution, and 80% believed cryopreservation to be a complicated. <sup>46</sup> - Insufficient knowledge a barrier in supporting FP for young breast cancer patients. <sup>58</sup> <b>Attitudes:</b> A lack of consideration of FP, <sup>41</sup> a moral objection to offer sperm banking in certain circumstances, a responsibility to decide on behalf of the patient, <sup>50</sup> a belief that success rates of female FP were too low to justify, FP was too expensive for female patients, <sup>53</sup> feeling anxious about treating fertility in breast cancer patients or concerned about unknown risk of cancer reoccurrence (with higher concern linked to male clinician status, private clinic vs hospital setting and partner or parent status of the clinician). <sup>58</sup>

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	<b>Institutional</b>	<ul style="list-style-type: none"><li>- 15-30% clinicians report no available onsite services.<sup>41,46</sup></li><li>-One study reporting oocyte and ovarian cryopreservation only available at 9% of institutions.<sup>46</sup></li><li>-Difficulty in finding appropriate facilities or a specialist by 64% of clinicians impacted FP referral rates.<sup>53</sup></li><li>- High turnover of staff in teaching hospitals<sup>41</sup> and lack of referral pathway a barrier to FP and counselling,<sup>52</sup> in particular for those in rural areas.<sup>17</sup></li><li>- No insurance, lack of resources, training or guidelines a barrier for FP in AYA patients.<sup>42</sup></li><li>- Fertility related policies were variable and in need of review.<sup>50</sup></li><li>- No training specialised in oncofertility.<sup>17</sup> Identified need for additional training and knowledge.<sup>53</sup></li><li>- Clinicians felt their institution did not prioritise fertility preservation.<sup>45</sup></li></ul>
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