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ORIGINAL RESEARCH

An Ethics-Informed, Comparative Analysis of Uterus Transplantation and Gestational Surrogacy for Uterine Factor Infertility in High-Income Countries

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Abstract Interest in the future, clinical implementation of uterus transplantation for uterine factor infertility was recently boosted by the demonstration of proof-of-concept for deceased uterus donation/transplantation. The ethical dimensions of living and deceased uterus transplantation are explored and addressed in the paper through their comparison to the ethical elements of an existing, legal, assisted reproduction practice in some high-income countries, i.e., gestational surrogacy. A set of six ethics lenses is used in the comparative analysis: reproductive autonomy and rights, informed choice/consent, relevant critical relational theories, health equity, theoretical application of the accepted living donation standard, and comparative benefits and burdens considerations. Gestational surrogacy, as currently practiced in some high-income countries, is the assumed, theoretical base-threshold for determination of ethical acceptability in assisted reproduction practices. The analysis demonstrates that (at the present time): 1) the ethical acceptability of living uterus donation/transplantation is less than that of gestational surrogacy in high-income countries, and 2) the ethical acceptability of deceased uterus donation/transplantation is roughly equivalent to that of gestational surrogacy. This leads to the conclusion that, at the present time, only one version of uterus transplantation practice, i.e., deceased uterus transplantation, should be considered ethically acceptable for possible clinical implementation in high-income countries.

Keywords Uterus transplantation · Gestational surrogacy · Ethical acceptability · Comparative analysis · Reproductive autonomy and rights · Informed choice

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Introduction

Interest in the future, clinical implementation of uterus transplantation (UTx) for uterine factor infertility (UFI), a form of anatomical infertility, was boosted by the demonstration of proof-of-concept for deceased uterus donation/transplantation in Brazil in 2016 (Maung 2019; Ejzenberg et al. 2018). If past experience with the development of novel assisted reproductive technologies (ARTs) is any guide, it seems likely that UTx will soon transition from its current experimental status to clinical implementation in some high-income countries (HICs). Given the historical pattern of innovative healthcare treatments and interventions, including ARTs, gaining clinical traction ahead of comprehensive ethical analysis, this appears to be an optimal, pre-implementation-of-practice time to explore and address the ethical dimensions of UTx. The paper uses a comparative analysis approach to achieve this objective. Two versions of UTx, i.e., the living and deceased practices, are compared to another assisted reproduction practice with significant ethical elements that is currently considered to be ethically acceptable in some HICs, i.e., gestational surrogacy (GS).

The ethics-related matters and issues associated with UTx, a practice described by Mianna Lotz as "radical [assisted] reproduction," are situated at the intersection of two health research and clinical care domains with significant ethical components/elements, i.e., assisted reproduction and organ donation/transplantation (Lotz 2018, 499; Arora and Blake 2014; Catsanos et al. 2013). Although both UTx and GS were developed to support genetically-related procreation and the subsequent social parenthood of intended parents, only the former practice provides a potential opportunity for female intended parents to experience (some aspects of) gestation. As such, UTx offers the potential fulfillment of "a desire not just for '[one's] own child' but for '[one's] own pregnancy'" (Catsanos et al. 2013, 65) and "something of positive experiential value over and above alternative methods of family creation" (O'Donovan 2018, 490).

The following set of six ethics lenses is used to compare the practices of UTx and GS for the management of UFI in HIC settings: reproductive autonomy and rights, informed choice/consent, relevant critical relational theories, health equity, theoretical application of the accepted living donation standard to UTx, and a consideration of comparative benefits and burdens. Using GS as practised in HICs as a theoretical base-threshold for determination of ethical acceptability in assisted reproduction (a not-argued-for assumption for the purposes of the paper), living and deceased versions of UTx practice are explored and compared to GS to determine whether the clinical implementation of one or both of these versions of UTx for the management of UFI should be considered ethically acceptable in HIC settings at the present time.

Scope and Additional Assumptions

The scope of the paper extends to the existing and possibly-actualized-in-the-future assisted reproduction practices of commercial and altruistic GS and commercial and altruistic living and deceased UTx. Gestational surrogacy, for the definitional purposes of the paper, involves the genetic participation of at least one intended parent who is genetically-related to the intended fetus/child. Given the acknowledged, potential, significant demand for UTx as a response to UFI and the research-based demonstration of proofs-of-concept for both living and deceased UTx, it is considered probable that living and deceased UTx will transition in the relatively near future from their current statuses as innovative research interventions to clinical applications in some HICs where GS is already an available, legal option (Bayefsky and Berkman 2016). Consistent with UTx research protocols to date, it is also assumed that, if and when UTx practices are implemented, they will involve pre-transplantation, in vitro fertilization (IVF) of female intended parents and, in successful circumstances, the delivery of live neonates by Caesarian section (CS) (Catsanos et al. 2013). For the purposes of the paper, an assumption is made that GS and UTx clinical practices will not be publicly-funded in HICs, i.e., intended parents will pay for the costs associated with these assisted reproductive practices through access to private health insurance plan benefits or through the use of their personal, financial resources.

Some relevant domains of possible ethical consideration are not critically addressed in the paper. One exclusion in this regard is analytical consideration of the existence in many HICs of interlocking pronatal and bionormative cultural/societal valorization biases that influence and promote the efforts of adult persons, qua intended parents, to conceive and raise genetically-related offspring (Cavaliere and Palacios-Gonzalez 2018; Sandman 2018). An alternative parenthood option for women with UFI, i.e., adoption, is not included in the analysis because of the intentional limitation of the scope of consideration to assisted reproduction practices that have the potential to produce genetically-related children (Lavoue et al. 2017). The breadth of the analysis is further narrowed in that a particular set of reproductive interests, i.e., those of transgender women, are not directly addressed in the paper.

The designation of *primarily-affected-others* (meaning those who are significantly affected by these practices other than the intended parents) in the paper refers in GS practice to surrogate women and born children and, in UTx practice, to living uterus donors and born children. The adjective *related* used in the paper references those particular circumstances in which uterus donors and surrogate women are socially situated within the close relational web of the intended parent(s), a category that is inclusive of close friends and family members by blood or marriage/partnership.

Use of a Selected Set of Ethical Lenses to Compare UTx and GS

I. Reproductive Autonomy and Rights

Both GS and UTx promote the reproductive autonomy and procreative liberty of well-resourced, intended parents with UFI. The conception, gestation, bearing/delivery, and raising of genetically-related children are socially accepted and culturally promoted components of the life plans of persons living in HICs who are functionally and financially capable of actualizing these goals (Douglas and Devolder 2019; Cavaliere and Palacios-Gonzalez 2018; Sandman 2018). Both practices further the reproductive interests of infertile women (and their partners, as present) by providing women who are unable to become pregnant, or to successfully carry pregnancies to term, with the opportunity to possibly become parents of genetically-related children.

While both GS and UTx practices promote reproductive autonomy in women with UFI, only UTx offers, and aims to enable, a missing, experiential component of reproduction for women with UFI that is highly valued by some women, i.e., fetal gestation. In the view of Lotz (2018), the full, autonomous interest of the infertile woman "should be understood as a *composite desire—to gestate and rear a biologically related child*" (501). This comparative consideration is further addressed in subsection VI.

Many persons within HICs consider the freedom to reproduce/procreate to constitute a negative right, i.e., this particular liberty should not be interfered with by third parties (the state, religious institutions, and other sets/groups of fellow citizens) as long as such pursuit of reproductive autonomy does not significantly reduce the liberty, or harm the interests, of others. The potential burdens that accrue to *primarily-affected-others* in GS and UTx practices, i.e., surrogate women, living uterus donors and children born of both practices are considered in detail in subsection VI. Reproductive liberty is considered by some to be a "specially protected [human] interest," and prominent authors in the field have claimed that there are no prima facie grounds to not extend the existing scope of ARTs to UTx (Arora and Blake 2014, 399; Bayefsky and Berkman 2016).

Some theorists go further in advocating for consideration of reproductive autonomy as a positive right. In reference to the views of these rights-advocates, Ruby Catsanos et al. (2013) comment that "reproductive autonomy has long been extended beyond the negative right of non-interference in relation to reproductive choices, to include the provision of [positive] assistance to those who want but are unable to reproduce" (72). If it could be successfully argued that reproductive liberty constitutes such a positive right to all phases/components of reproduction, and there was the political will to actualize this through relevant legislation and health policy in HICs, claims could conceivably be made that UTx for the management of UFI should be promoted through such avenues as publicly-funded research and eventual clinical practice implementation. The considerable body of research already performed to develop and evaluate ARTs lends some, limited pragmatic support to the notion that the current support of such technologies enables the exercise of a positive reproductive right. However, so far, most of the conducted, relevant ART research and clinical implementation has had genetically-related procreation as its goal, not the provision of experiential gestation. As such, social acceptance of a positive right to reproductive autonomy/liberty that supports the access of infertile, intended parents to existing ARTs does not automatically extend to a corresponding positive right to the direct, gestational experience of female, intended parents. A publicly-embraced conception of positive reproductive rights could conceivably lend support to full or partial public funding of GS in HICs but, at the present time, a large shift/stretch in public opinion and procreative imagination would be required to effectively ground a social claim to public financial support for experiential gestation through UTx.

II. Informed Choice/Consent

There are significant differences between UTx and GS practices in the domain of choice/consent. In most HIC settings where GS is legal and available, both the intended parents and surrogate women (the latter qua *primarily-affected-others*) are reasonably well informed about the nature of this assisted reproductive practice and its related benefits and burdens for both transactional parties (Ruiz-Robledillo and Moya-Albiol 2016). This is not the case for UTx. At the present time, consent to living uterus donation is weakened/degraded by the current, suboptimal nature of research-generated evidence/knowledge (and related clinical and social understandings) of the risks and potential harms to uterus donors and female, intended parents. As of 2018, there

were no published accounts or reports of the lived experiences of uterus donors (Guntram and Williams 2018).

Further, in deceased uterus donation, no meaningfully informed, pre-mortem donor consent is possible due to the current lack of public awareness of this particular form of organ donation/transplantation (OD/T). The signing of a general affirmative, organ donation statement or declaration does not adequately cover-off the relevant, informed consent requirements for deceased UTx, as is generally appreciated to be the case for another, standard OD/T practice, i.e., donation after circulatory determination of death, without provision in this practice for the separate consent of the legitimate substitute decision-maker for the specific use of pre-mortem investigations and interventions that are happening to a living person who will not therapeutically benefit from them (Kirby 2013).

In the case of altruistic-living-related uterus donors and altruistic-related surrogate women, the potential for weakening/degradation of informed choice/consent exists on the basis of the possible exertion of relationally based influence, manipulation, and/or coercion (O'Donovan 2018; Blumenthal-Barby 2012). This vulnerability and a set of other potential burdens accruing to adult *primarily affected others*, i.e., uterus donors and surrogate women, are described in detail in subsection VI. The possible jeopardizing of informed choice/consent through financial influence has been analysed in the research context of commercial-unrelated GS in low-income country (LIC) settings where this possible effect on surrogate women is typically referred to in the literature as undue inducement (Macklin 1988). This particular consideration is likely to be of less significance in commercial GS arrangements that are situated in HICs given that the degree/magnitude of possible, positive influences on the life plans of surrogate women is typically less than in LIC circumstances (Kirby 2014).

III. Relevant Critical Relational Theories

A number of critical feminist conceptions could be of relevance to the comparison of GS and UTx practices, including fragmentation, commodification, and social group oppression. Fragmentation of the so-called *natural* reproduction process for women, i.e., sequential conception, gestation, childbirth, and child-raising/social-parenthood, is a relevant lens to apply to the assisted reproduction practices under consideration. Gestational and other forms of surrogacy have long been critiqued by traditional feminist theorists for the so-called, inherent corruption of the *natural* bond between mother and child and the related, essential fragmentation of the reproductive process into divisible genetic, gestational, and social components (Williams-Jones 2002). UTx, on the other hand, intentionally seeks to mitigate such reproductive-process fragmentation for women with UFI. However, limitations in the scope/range of gestational experiences provided to intended, female parents by UTx, e.g., no "kicking"-type, sensory experiences due to the absence of neurologically-mediated uterine sensitivity, and the associated practice requirements of IVF and CS tend to weaken the claim that UTx provides/promotes *natural* reproduction (McTernan 2018; Catsanos et al. 2013).

A claim of commodification of reproductive labour, where procreation is permitted or encouraged to move into the marketplace where it becomes a fungible object for sale and purchase (where, according to some theorists and clinicians, it should not be traded under any circumstances), has been levied against commercial GS and could possibly in the future be levied against commercial UTx (Koplin 2018; Hanna 2010; Wilkinson 2000). A possibly drawn distinction between the emotionally-loaded frame of "renting a womb" in commercial GS and the frame of "buying a womb" in commercial UTx is unlikely to be considered of much significance by those who wish to make the critical charge of commodification against these assisted reproduction practices.

Legitimate critiques of GS as a demonstrable oppressive practice in LICs cannot be easily applied to the particular circumstances of GS in HICs where it is more difficult to support arguments that most surrogate women situated in these settings are significantly compromised members of a historically marginalized or otherwise disadvantaged social group. Considering, for example, Iris Marion Young's conception of democratic cultural pluralism, it is not clear that the life circumstances of surrogate woman living in HICs necessarily meet one or more of Young's five face-criteria for social group oppression, i.e., marginalization, exploitation, powerlessness, cultural imperialism, and violence (Young 1990). With regard to UTx practice, although comprehensive empirical and/or qualitative research evidence does not exist, it is also not obvious that altruistic or commercial living uterus donors will collectively meet Young's criteria for membership in an oppressed

social group. Considering the related moral wrong of exploitation, GS as practiced, and UTx as possibly practiced in the future, in HIC settings (as opposed to how it is being practiced in some LICs) may not be exploitative of adult *primarily affected others* in the sense that these assisted reproduction arrangements/transactions constitute the taking of unfair advantage (as traditionally understood), where one party gains at the expense of another party who is relatively disadvantaged on economic, social, and/or political grounds (Kirby 2014; Wertheimer 1996).

IV. Health Equity

The assumption, for the purposes of the paper, that GS and UTx practices will not be publicly-funded if and when UTx is clinically implemented in the future in HICs reduces the scope of comparison of these practices through application of the lenses of traditional, distributive justice and health equity. A government decision to publicly fund either or both of these expensive, infertility practices could engender a claim by those who oppose such public funding that such a decision would result in unjustified opportunity costs in the usual HIC context of limited health resources to meet all the myriad healthcare needs of persons, even though the case for public funding in the context of anatomical infertility, such as UFI, may be somewhat easier to make than for senescent, relational, and social variants of infertility (Maung 2019; Sandman 2018; Wilkinson and Williams 2016). The health inequity consideration related to possible, future public funding of implemented GS and UTx practices is not solved by a government decision to not allocate limited health resources in these ways, given that considerable public monies have been, and are still being, used to perform research related to these infertility practices (Cavaliere and Palacios-Gonzalez 2018).

There is an important equity consideration that is not affected by the paper's assumption. If both practices can only be accessed through the use of personal, private resources and/or holding high-end, vocationally-based health insurance, the vast majority of intended women/parents with UFI situated in HICs will not be able to access either practice. Although, it is anticipated that UTx will be more expensive than GS when the former practice transitions to clinical implementation, the expected cost differential will only affect the assisted reproduction equity/access interests of those situated in the upper-middle class in the sense that some persons in this income bracket in HICs may be able to afford GS but not UTx (Sandman 2018).

In the context of privately-funded ARTs, it could be argued that individuals in HICs who have abundant financial resources should not be discriminated against by legislative and policy decisions that could limit their access to such practices, i.e., their negative right to assisted reproduction should be respected in this regard. However, supporting this claim is not straight-forward, as when things go badly, as they sometimes do by way of surgical complications and unanticipated adverse outcomes, publicly funded healthcare systems, in jurisdictions where they exist, can end-up shouldering the significant financial and other health resource burdens that accrue to their medical management (Catsanos et al. 2013). This is analogous to the known, significant, resource burdens associated with medical tourism (when patients return to their home health jurisdictions with surgical complications) which negatively impacts national, socialized health systems (Beland and Zarzeczny 2018). As described in subsection VI, emerging, expensive health needs on the basis of surgical complications and adverse outcomes that have the potential to burden a public healthcare system in inequitable ways are more likely to arise in UTx practice than in GS practice. A possible mechanism to mitigate the risk of burden to a publicly-funded health system of clinical implementation of UTx would be to require uterus transplant recipients to have private healthcare insurance in place beforehand that would provide comprehensive coverage for any adverse outcomes and complications of the uterus donation and uterus transplantation surgeries and any subsequent pregnancies of the recipient (Blake 2018; Balayla 2016).

V. Theoretical Application of the Living Organ Donation Standard

The current, generally accepted standard for the ethical permissibility/acceptability of living, solid organ donation* can be articulated as follows (Williams 2018):

1. The donation produces an overall positive/favourable balance of harm-benefit for donors and recipients which cannot be achieved in a less harmful manner.
2. The donation is not likely to cause significant and long-term morbidity to, or the death of, the donor.

3. Valid informed consent can be, and is, provided by the capable donor.

*It is acknowledged that this living donation standard is not endorsed by all. On one end of the spectrum of the theoretical debate, strict libertarians contend that the valid, informed consent of the living donor is all that is required for donation to be ethically permissible. At the other end of the spectrum, Aaron Spital argues that the benefits to the living donor must exceed the risks/harms to the donor (Spital 2004). It is also recognized that this standard is typically applied to the living donation of solid organs that are potentially life-saving to organ recipients. Given that UTx is not potentially life-saving for the recipient or any other existing person, an argument could be made that the appropriate standard for UTx, and for the comparative purposes of the paper, should be stronger than the generally accepted one for solid organ donation, i.e., it should be somewhat closer to end of the spectrum where Spital's view is situated.

For comparative purposes, the corresponding, theoretical versions of the standard's three criteria for application to GS practice can be stated as follows:

1. Gestational surrogacy provides an overall positive/favourable balance of harm-benefit for surrogate women and female intended parents which cannot be achieved in a less harmful manner.
2. GS practice is not likely to cause significant and long-term morbidity to, or the death of, the surrogate woman.
3. Valid informed consent can be, and is, provided by the capable surrogate woman.

With regard to the criterion 1 comparison, a detailed analysis of the benefits and burdens of UTx and GS is provided in subsection VI. If the objective of both practices is framed as the potential production of a child that is genetically related to an intended parent(s) in circumstances of UFI, UTx will not meet criterion 1 given one of the findings of subsection VI, i.e., UTx is, overall, a more harmful practice than GS for achieving this objective. However, if the additional goal of some gestational experience by the female intended parent is considered as one of two primary objectives, regardless of the balance of harm-benefits for donors and recipients, only UTx meets these particular dual objectives and criterion 1 is met for UTx practice.

With regard to the criterion 2 comparison, given the research-based evidence to date (as documented in subsection VI), it can be stated (at least in a preliminary way) that "it is not unlikely that" UTx as clinically practiced in the future will cause significant and long-term morbidity to the donor (to use the awkward phraseology of the criterion). So criterion 2 is not met for UTx. Clinical research has demonstrated that GS practice is unlikely to cause significant, long term morbidity and mortality to surrogate women, so GS meets criterion 2.

With regard to the criterion 3 comparison, at the present time, it not possible for living uterus donors (qua primarily-affected-others) to provide fully informed consent for UTx due to the lack of objective evidence about the risks and potential burdens that may accrue to them because of their participation in the practice. So, currently, criterion 3 is not met for UTx. However, it is possible that criterion 3 may be met in the future once the set of risks/burdens described in subsection VI are better researched and understood. Despite concerns about the possibility of relational influence in altruistic-related GS, it is possible for surrogate women in various GS arrangements in HIC settings to provide informed consent for these practices.

Deceased UTx practice (theoretically) meets criterion 1 of the accepted donation standard if the dual objectives of a genetically-related child(ren) and the gestational experience of the female intended parent are considered. Given the lack of a living donor in this assisted reproduction context, criteria 2 and 3 cannot be relevantly applied.

VI. Comparative Benefits and Burdens Considerations

In this section, the benefits and burdens of the two practices to intended parents and *primarily-affected-others*, i.e., surrogate women and born children for GS, and uterus donors and born children for UTx, are compared in a head-to-head fashion.

a. Benefits to the intended parent(s):

Both GS and UTx provide a potential opportunity for women with UFI to have and raise a genetically-related

child. Only UTx provides female intended parents with some of the hormonally mediated, physical and affective experiences of gestation and childbirth including recognition and (for the most part positive) valuation by others, e.g., family, friends, and society as-a-whole, of the social role of pregnancy/gestation (Catsanos et al. 2013). As Kavita Shah Arora, and Valerie Blake (2014) comment, uterus transplant recipients who become pregnant "will be visibly pregnant, emotionally pregnant and seen as pregnant by society" (398). There is less fragmentation of the *natural*, sequential process of conception, gestation, and childbirth with UTx than with GS. In addition, intended parents have more personal control over gestational influences on the developing fetus, e.g., participation in medical decisions that affect the fetus, nutritional choices, use of alcohol, tobacco, and illicit drugs, with UTx than they do with GS (Catsanos et al. 2013). On the other hand, only with GS, is there complete elimination of possible personal, physical, health-related pregnancy and childbearing risks for the intended female parent.

b. Burdens to the intended parent(s):

Access to both GS and UTx will incur a significant financial burden to most (not wealthy) intended parents with UFI (as per the paper's assumption that these ARTs will not be publicly funded if and when UTx is clinically implemented in the future). IVF, required by both practices, poses risks to female intended parents from the uses of GnRH agonist and antagonist protocols for ovarian stimulation, including a 0.1 to 3 per cent risk of ovarian hyperstimulation syndrome (Farrell and Falcone 2015; Dar et al. 2015; Olausson et al. 2014). In UTx practice, female intended parents undergo invasive abdominal/pelvic transplantation surgery, with attendant anaesthesia, graft rejection, and infection risks. They are exposed to immunosuppressive medications for two or more years with associated, slightly increased risks of cancer and infection (Catsanos et al. 2013). Immunosuppression during pregnancy is also associated with a slightly increased risk of maternal morbidity. There is a requirement for regular monitoring of UTx recipients during the (typically recommended one year) interval between transplantation and attempted conception including periodic cervical biopsies to evaluate the degree/extent of uterine rejection. With UTx, it is recommended and anticipated that most female intended parents will undergo hysterectomy after a successful birth or two or after an interval of demonstrated, continued infertility in order to reduce their risk of long-term immunosuppression.

There is a greater potential for accrued legal burden with GS than with UTx in some HIC jurisdictions. As Carla Spivack (2009) comments, there are "widely different laws among [the American] states [and] no single statutory regime has won widespread acceptance" (97). It is anticipated that UTx practice will entail less legal and regulatory uncertainty because, in successful circumstances, the female intended parent carries and gives birth to her genetically-related infant.

iii. Benefits to adult *primarily-affected-others* (surrogate women and uterus donors)

In commercial arrangements, financial payments to surrogate women and (theoretically in the future) to unrelated living uterus donors can provide them with additional life opportunities (and possibly expand their range of options for personal agency, e.g., enhanced access to post-secondary education) that they consider and possibly activate within their chosen life plans. For altruistic-related GS and UTx arrangements, there is the possibility of positive, meaningful expansion of the relational web of these women (Olausson et al. 2014). In altruistic-unrelated arrangements, surrogate women and uterus donors could potentially experience a significant, positive affective (emotional well-being) response as the result of freely giving something of importance to another person (Ruiz-Robledillo and Moya-Albiol 2016). With particular regard to UTx practice, Laura O'Donovan speaks of the possibility of "a positive psychological experience—the satisfaction of having enabled the recipient to attempt to carry her own pregnancy" (494).

iv. Burdens to adult *primarily-affected others* (surrogate women and uterus donors)

In existing, commercial GS and theoretically-possible-in-the-future commercial UTx arrangements, influence could be exerted by the surrogate woman's or uterus donor's partner and/or greater family to encourage/coerce participation, although this is likely to be of a lesser degree of magnitude in HICs than what is known to occur in commercial GS arrangements in some LICs. Surrogate women in HICs incur the usual risks/burdens of pregnancy and delivery in addition to low risks

associated with artificial hormonal manipulation in the cycles leading up to pregnancy (while not incurring the risks of IVF which fall to female intended parents in both practices). As commercial surrogate women tend to be young and healthy without a history of significant complications in a prior pregnancy(ies), they experience a relatively low rate of maternal complications (Dar et al. 2015). The energy and time invested in the gestation of a fetus that is not genetically or legally their own reduces/limits the opportunity of surrogate women to pursue other personal life goals, and may challenge/complicate their psychosocial functioning in multiple domains including family/relational life, educational activities, vocational functioning, etc. Some surrogate women may experience a psychological burden related to having to "give up" the infant that they have gestated and given birth to.

For altruistic-related GS and UTx arrangements, surrogate women and uterus donors may be the subject of manipulative influence exerted by related others who hold stakes in the potential outcomes. In the context of GS practice, it is known that potential surrogate women may feel an internal pressure/compulsion to participate in the absence of any obvert, external influence (Guntram and Williams 2018). Also, as Emily McTernan (2018) comments in reference to the possible clinical implementation of UTx in the future, " … when encouraging donations from family members, [the infertile person/couple] may be exploiting a socially engrained gender expectation that women be self-sacrificing" (482).

Uterus donors foreclose the option of having further pregnancies of their own in a definitive way. Lisa Guntram and Nicola Jane Williams (2018) comment that "a uterus is only expendable if the potential donor is unequivocally certain that she will not now nor in the future desire another pregnancy herself" (513). Uterus donors undergo major, invasive, prolonged abdominal/pelvic surgery that is significantly different from a standard hysterectomy because of the requirement to preserve the vascular support of the donated uterus through extensive vascular dissection, i.e., surgical isolation and separation of the relevant blood vessels from the donor's surrounding tissues (Brannstrom et al. 2015). Uterus donation involves prolonged surgical and anaesthesia times, e.g., nine to twelve hours and, typically, the post-partum, in-hospital care is prolonged, e.g., for five to seven days (Farrell and Falcone 2015; Brannstrom et al. 2015). Surgical risks, medical complications, and adverse events include: injury to the ureters (tubes from the kidneys to the bladder), other urinary tract complications, perioperative bleeding, thromboembolism, infection with subsequent fistula (abnormal tube between hollow organs) formation, and rhabdomyolysis (extensive muscle breakdown) with possible, associated renal failure. With specific regard to ureteral injury, the reported incidence is 14 per cent for uterus donation surgery while the incidence with standard hysterectomies is less than 0.5 per cent (Shapiro and Ward 2018). For post-menopausal uterus donors, there is the additional burden of hormonal re-initiation of several menstrual cycles prior to the donation surgery with an associated increased risk of thromboembolism.

e. Benefits to born children

Infants born to commercial surrogate women in HICs are usually the products of natural pregnancy and delivery given the pre-tested history of prior successful pregnancy(ies), a healthy uterine environment, and the normal health status of young surrogate women. With UTx practice, it is theoretically conceivable that optimal personal control over gestational influences could translate into better health outcomes for the neonate/child in some circumstances than can be achieved with GS, although this has not been evaluated or demonstrated through research, and any related small, comparative benefit is likely to be matched and balanced by the small burden to born children associated with the immunosuppressed gestation of female intended parents who undergo UTx.

f. Burdens to born children

Fetal exposure to immunosuppression during pregnancy in UTx can slightly increase the risk of: preterm delivery, low birth weight, and neonatal infection. However, most children born to women on immunosuppressive medication for other health reasons, e.g., prior, solid organ transplantation of other types, do not experience significantly adverse outcomes. Negative, psychological reactivity may be experienced by the child/adolescent in later life at the time of their acquired knowledge of gestational carriage by a surrogate woman or within a transplanted uterus. Surprisingly little is known about the outcomes in children who are the products of surrogacy arrangements, given that gestational surrogacy has been practiced for decades. Susan Golombok and colleagues demonstrated that there were

no observed significant differences in psychosocial characteristics observed in the offspring of surrogacy arrangements at the ages 2, 3, 7, and 10 compared to those born through *natural* conception or egg donation (Golombok et al. 2011; Ruiz-Robledillo and Moya-Albiol 2016). Inferior, overall physical health status and emotional well-being among children born of GS practice as compared to children born in *natural* or other ways has not been demonstrated. In the existing, necessarily limited literature to date, there is no speculation regarding the anticipation of inferior health and well-being outcomes for children born of UTx arrangements.

Discussion and Conclusion

The pursuit of a genetically-related child(ren) is a socially endorsed, possible component of a person's life plan in HICs. It is generally accepted that infertile persons, qua intended parents, have a negative right not be interfered with, or obstructed, in their attempted accessing of legal, available ARTs which they have the resources to pursue for themselves.

The forgoing benefits vs. burdens comparative analysis indicates that one of the most significant differences between UTx and GS practices lies in the category of risks taken by, and the potential burdens that may accrue to, adult *primarily affected others.* In GS practice, most surrogate woman do well from a physical health perspective/standpoint given that they are usually young and healthy and, in the case of commercial arrangements, have already successfully given birth. Currently, as described in subsection VI, uterus donation surgery, and the prolonged anaesthesia for same, poses significant health risks to the living donor. A component of condition 1 of the accepted standard for living organ donation, i.e., that the donation/transplantation produces an overall positive/favourable balance of harm-benefit for donors and recipients, is not met in living UTx. This ethical concern is augmented further, if a stronger emphasis on risks and potential burdens to the donor than exists in the accepted standard is applied to these particular living donation circumstances, given that uterus donation/transplantation, unlike many other solid organ donations/transplantations, is not potentially life-saving for an existing person. Also, given the current lack of high-level evidence regarding post-surgical and long-term psychological outcomes, it is not possible for living donors to make a fully informed choice about uterus donation at this time. This concern is amplified in altruistic-related-directed UTx where the potential for degradation of informed choice on the basis of possible pro-donation influence by related others exists and needs to be factored into the analysis. The burdens that accrue to female intended parents in UTx practice are higher than those that are incurred by female intended parents who participate in GS practice. From a broader, societal perspective, the clinical implementation of living UTx practice risks the inequitable occurrence of an unfair allocation of limited health resources in publicly funded health jurisdictions in HICs, given that uterus donation surgery (as presently performed in research protocols) can result in significant complications and adverse events that generate health needs that must be addressed in publicly funded hospitals and clinics.

In the context of living UTx practice, at the present time, the possible quality-of-maternal-life-related benefit of some gestational experience that can be provided to one person (the female intended parent) does not appear to justify the significant risks and potential health burdens that accrue to the adult *primarily affected other* (regardless of the possibility of some financial and psychological benefits accruing to the donor) and, to a lesser extent, the female intended parent. Overall, the analysis indicates that living UTx in HICs cannot be considered as ethically acceptable as the baseline-threshold for determination of ethical acceptability in assisted reproduction that is assumed for the purposes of the paper, i.e., GS practice in HICs.

The analysis and argumentation changes/shifts if deceased UTx is considered as a legitimate practice option for the female intended parent to achieve the relevant, dual benefits of having a genetically-related child(ren) and experiencing some features/elements of gestation (with the associated benefit of reduced fragmentation of the *natural* reproductive process as compared to GS). All of the significant, health-related risks and potential burdens identified for living UTx donors fall away from the burdens vs. benefits calculus. Although female intended parents cannot make a fully informed choice about proceeding with deceased UTx at the present time due to the lack of high-level evidence and knowledge about the short and long term outcomes of being a uterus recipient, a woman with UFI who strongly desires gestational experience as part of her life plan could make a reasonably informed decision to participate in deceased UTx practice without requiring an adult *primarily affected other* to assume very significant health risks/

burdens. Most of the risks and potential harms associated with deceased UTx practice accrue to female intended parents who, given their relatively privileged situation in HIC settings, are reasonably well positioned to decide whether to proceed with this assisted reproduction practice. In some HICs, particularly the United States and Canada, the hyper-privileging of individual autonomy in health-related decision-making, and the presence of strong, existing support for a person's negative right not to be interfered with in her/his chosen pursuit of ARTs and other novel treatments/interventions, lends some philosophical and sociocultural support to female intended parents with UFI (and their partners, as present) who strongly wish/desire to access deceased UTx at their own health risk and personal financial cost. Criterion 1 of the accepted donation standard considered in subsection V is (theoretically) met in deceased UTx practice if the described, dual objectives are considered. Also, with regard to a key element of the informed consent process, it is unlikely that female intended parents will be influenced or coerced to pursue deceased UTx rather than GS by their partners and others situated within their relational webs, given that the latter practice could (more safely) provide the same positive outcomes in terms of their own particular, relational experiences as parents and loved ones. The identified risks/burdens to born children are anticipated to be low for UTx and of roughly the same degree as for GS, given existing knowledge about the generally good outcomes for children who are born of mothers who have been immunocompromised during gestation. With regard to a consideration of equity at the societal level, uterus transplantation surgery does pose some risk of the occurrence of an inequitable allocation of limited health resources through the subsequent, possibly required, public funding of complications and adverse outcomes, but this is lesser in magnitude than that associated with uterus donation surgery.

On the donation side, with particular reference to deceased UTx, it is recognized that women in HICs are not currently able to make an informed, premortem choice while healthy/well about whether to donate their uteruses when they die at some, indefinite time in the future, given the present lack of awareness of the general public about this specialized organ donation option. Short of routinely listing this option on general affirmative organ donation statements/declarations (which could be cumbersome as more specialized donation practices emerge), the partial fix that is now widely accepted in some HICs regarding organ donation after circulatory determination of death is available for use in deceased UTx practice, i.e., separate, fully informed consent for uterus donation could be provided post-mortem by the legitimate substitute decision-maker(s).

Overall, the comparative analysis demonstrates that, on the basis of the application of the chosen set of relevant ethical lenses, the future, clinical implementation of deceased UTx practice would be roughly equivalent to existing GS practice in HICs in terms of its ethical acceptability for the management of UFI. Given that GS as practiced in some HICs is the assumed, theoretical base-threshold for determination of ethical acceptability for the purposes of the paper, it is possible to conclude that deceased UTx should be considered ethically acceptable for the management of UFI. Given that the analysis indicates that living UTx practice is less ethically acceptable than existing GS practice in HICs, until such time in the future that uterus donation is demonstrated to be significantly safer for the living donor than is currently appreciated (which may be possible with advancements in robotic-assisted, surgical applications and the generation of more high-level evidence/knowledge regarding effective management of relevant complications), only one version of UTx practice, i.e., deceased UTx, should be considered ethically acceptable for possible, clinical implementation in HICs for the management of UFI.

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