Cumulative Clinical Pregnancy and Live Birth Rates from Autologous In Vitro Fertilization Treatment Cycles in Canada

Why it is important to report cumulative clinical pregnancy and live birth rates?

To estimate cumulative success with ongoing treatment, rather than success per individual stage of the treatment process.

Definition of data

The Canadian Assisted Reproductive Technologies Register (CARTR) Plus data for all autologous oocyte retrieval cycles and associated frozen embryo transfer (FET) cycles within one year of the oocyte retrieval date were included in the cohort. For metrics relating to clinical pregnancy, oocyte retrievals with a cycle start date between January 1st, 2013 and December 31st, 2019 were included; for birth outcome metrics, oocyte retrievals with cycle start dates between January 1st, 2013 and December 31st, 2018 were included.

Clinical pregnancy was defined as the presence of a gestational sac on ultrasound and inclusive of clinical intrauterine, heterotopic, or ectopic pregnancies. Live birth was defined as at least one live-born baby.

Oocyte retrieval cycles and no ET

38.1% of oocyte retrieval cycles achieved clinical pregnancy within one year of oocyte retrieval. A total of 109,324 oocyte retrievals were performed in Canada between 2013 and 2019. Of these, 25,367 (23.2%) oocyte retrieval cycles did not have an associated embryo transfer within one year of the oocyte retrieval date. Common reasons indicated for no embryo transfer include: no utilizable embryos (6,345), no normal fertilization (3,761), no oocytes (1,620), no utilizable oocytes (789), and no sperm (180).

Clinical pregnancy rate per oocyte retrieval

Of the 83,957 oocyte retrieval cycles with at least one embryo transfer within one year of the oocyte retrieval, 41,640 (49.6%) resulted in at least one clinical pregnancy (Figure 1). 40.2% of oocyte retrievals resulted in a clinical pregnancy from the first embryo transfer; clinical pregnancy rate moderately decreased with each subsequent embryo transfer to 33.6% by the fourth transfer. Patient age at the time of oocyte retrieval is an important factor that is associated with the number of oocytes retrieved and the quality of the oocytes and subsequent embryos. Figure 2 illustrates clinical pregnancy rates by patient age at time of oocyte retrieval. As expected, embryo transfer-specific and cumulative pregnancy rates decreased with increasing patient age. Note that the sample size was small for older patient ages at higher order embryo transfers. At the fourth embryo transfer for the ≥43 years of age group, the denominator was too small for clinical pregnancy rate to be interpretable in Figure 2.

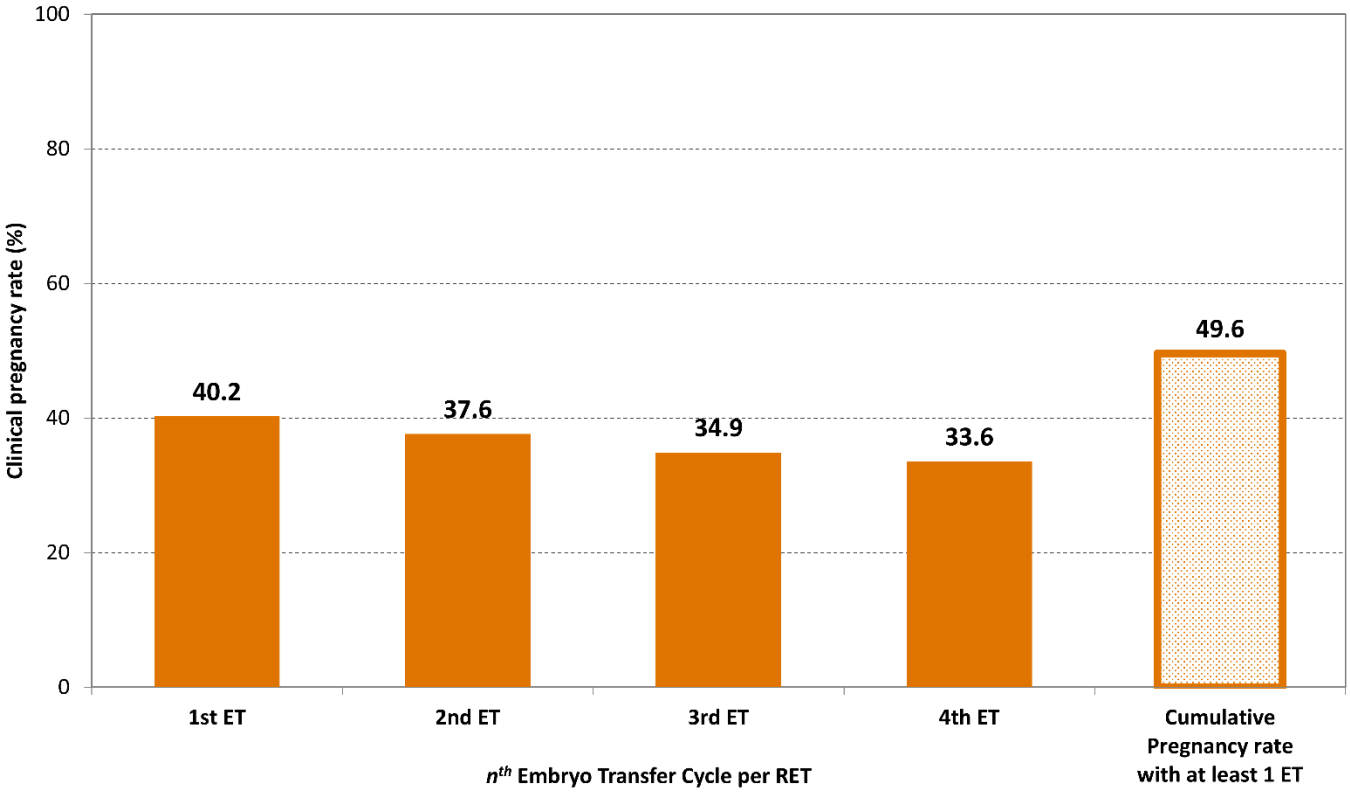

Figure 1: Embryo transfer-specific and cumulative clinical pregnancy rates in autologous IVF cycles, per oocyte retrieval, CARTR Plus 2013-2019. An nth embryo transfer (ET) cycle was defined as each subsequent ET cycle resulting from a single oocyte retrieval cycle numbered according to their transfer cycle start date; only ET cycles within 1 year of their respective oocyte retrieval cycle were included. Clinical pregnancy rate at each nth ET was defined as the number of clinical pregnancies resulting from the nth ET cycle per oocyte retrieval divided by the number of nth ET cycles. The cumulative pregnancy rate was defined as the number of oocyte retrievals resulting in at least 1 clinical pregnancy within 1 year of the oocyte retrieval divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.

Accessibility link: For the long description of Figure 1, see page 8

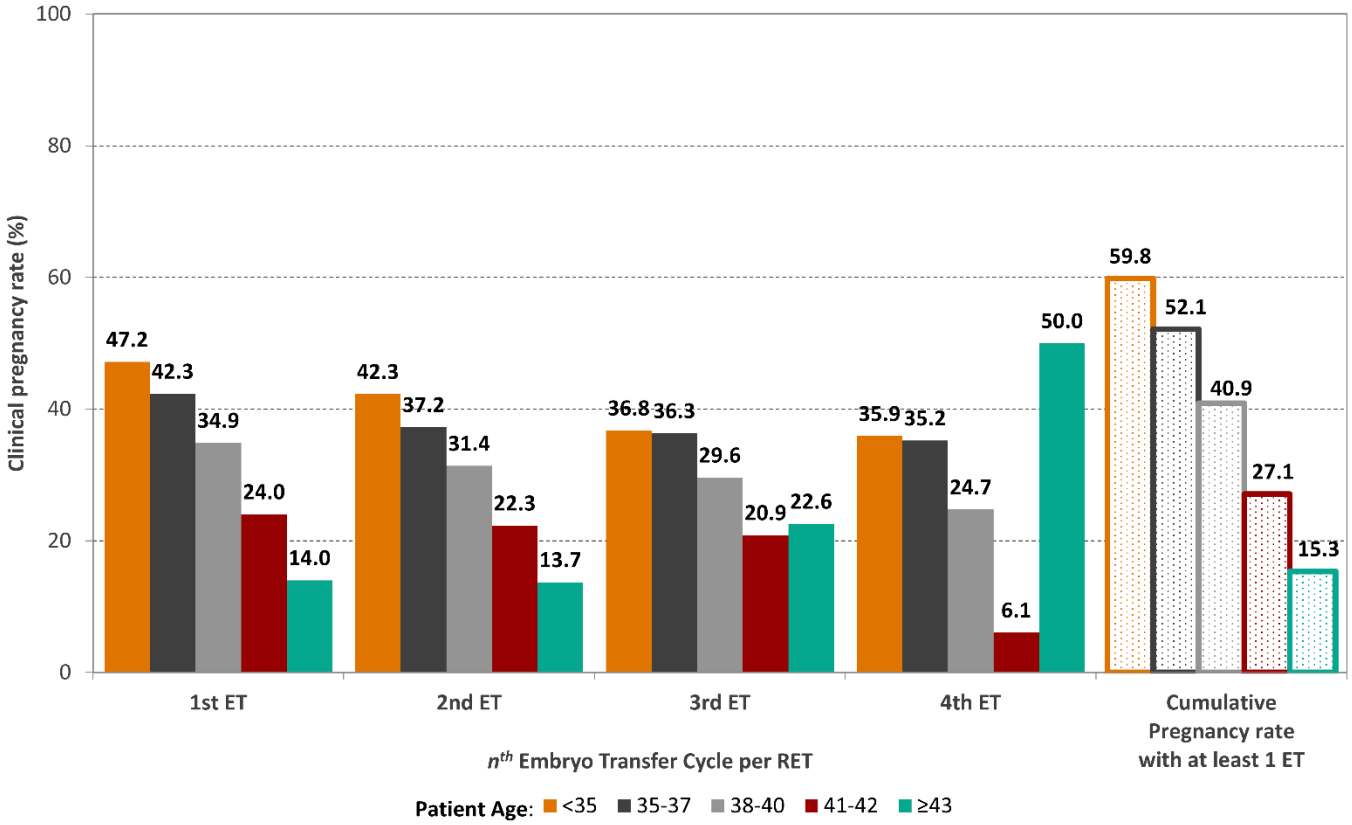

Figure 2: Embryo transfer-specific and cumulative clinical pregnancy rate in autologous IVF cycles, per oocyte retrieval, by patient age at oocyte retrieval, CARTR Plus 2013-2019. An nth embryo transfer (ET) cycle was defined as each subsequent ET cycle resulting from a single oocyte retrieval cycle numbered according to their transfer cycle start date; only ET cycles within 1 year of their respective oocyte retrieval cycle were included. Clinical pregnancy rate at each nth ET was defined as the number of clinical pregnancies resulting from the nth ET cycle per oocyte retrieval divided by the number of nth ET cycles. The cumulative pregnancy rate was defined as the number of oocyte retrievals resulting in at least 1 clinical pregnancy within 1 year of the oocyte retrieval divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.

Accessibility link: For the long description of Figure 2, see page 8

Clinical pregnancy rate per patient

From 2013 to 2019, a total of 65,530 unique patients had at least one oocyte retrieval cycle with an embryo transfer. Of these, 38,796 (59.2%) patients achieved at least one clinical pregnancy within one year of oocyte retrieval. Figure 3 shows the embryo transfer-specific pregnancy rate for each subsequent oocyte retrieval per patient. Clinical pregnancy rates decreased with each subsequent oocyte retrieval cycle and with each subsequent embryo transfer for each oocyte retrieval. Due to the small number of patients with 3 or 4 oocyte retrieval cycles, subsequent embryo transfer cycles may not show a strictly linear decrease in rate.

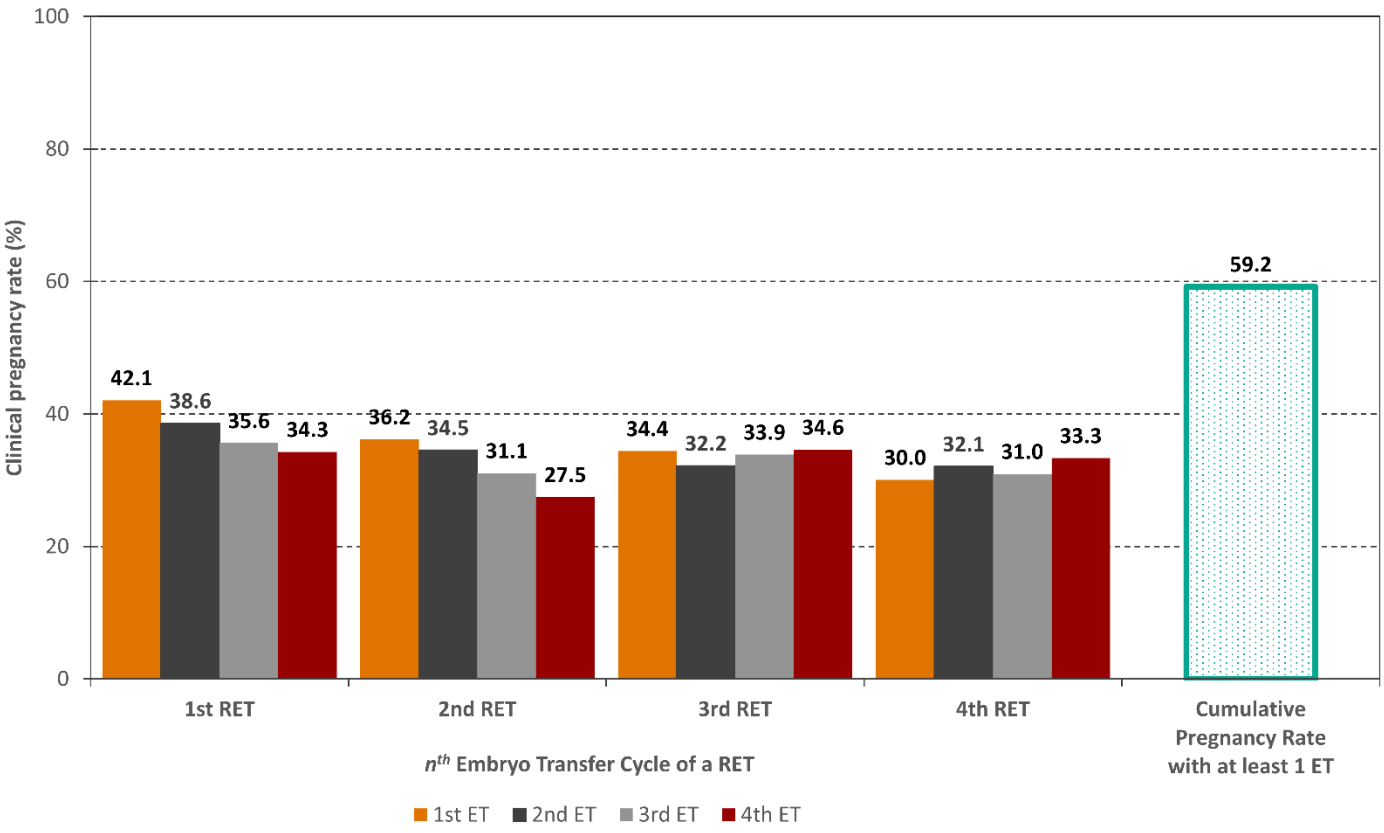

Figure 3: Embryo transfer-specific and cumulative clinical pregnancy rate in autologous IVF cycles, per patient, CARTR Plus 2013-2019. An nth oocyte retrieval (RET) was defined per patient, where each subsequent oocyte retrieval cycle was numbered according to their cycle start date. An nth embryo transfer (ET) cycle was defined as each subsequent ET cycle resulting from a single oocyte retrieval numbered according to their ET cycle start date; only ET cycles within 1 year of their respective oocyte retrieval cycle were included. Clinical pregnancy rates at each nth ET was defined as the number of clinical pregnancies resulting from the nth ET cycle per oocyte retrieval cycle divided by the number of nth ET cycles. The cumulative pregnancy rate was defined as the number of oocyte retrievals resulting in at least 1 clinical pregnancy within 1 year of the oocyte retrieval cycle divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.

Accessibility link: For the long description of Figure 3, see page 9

Live birth rate

Figures 4-6 illustrate live birth rates from 2013 to 2018. There were 74,396 oocyte retrieval cycles with at least one embryo transfer within one year and 27,596 (37.1%) resulted in a live birth. If all oocyte retrieval cycles, with or without an embryo transfer were included, the cumulative live birth rate was 29.2% (27,612/94,516). Embryo transfer-specific live birth rates ranged from 29.6% for the first embryo transfer to 22.1% for the fourth embryo transfer per oocyte retrieval cycle. A similar trend was seen when stratified by patient age at the time of oocyte retrieval and when displayed on a per patient basis.

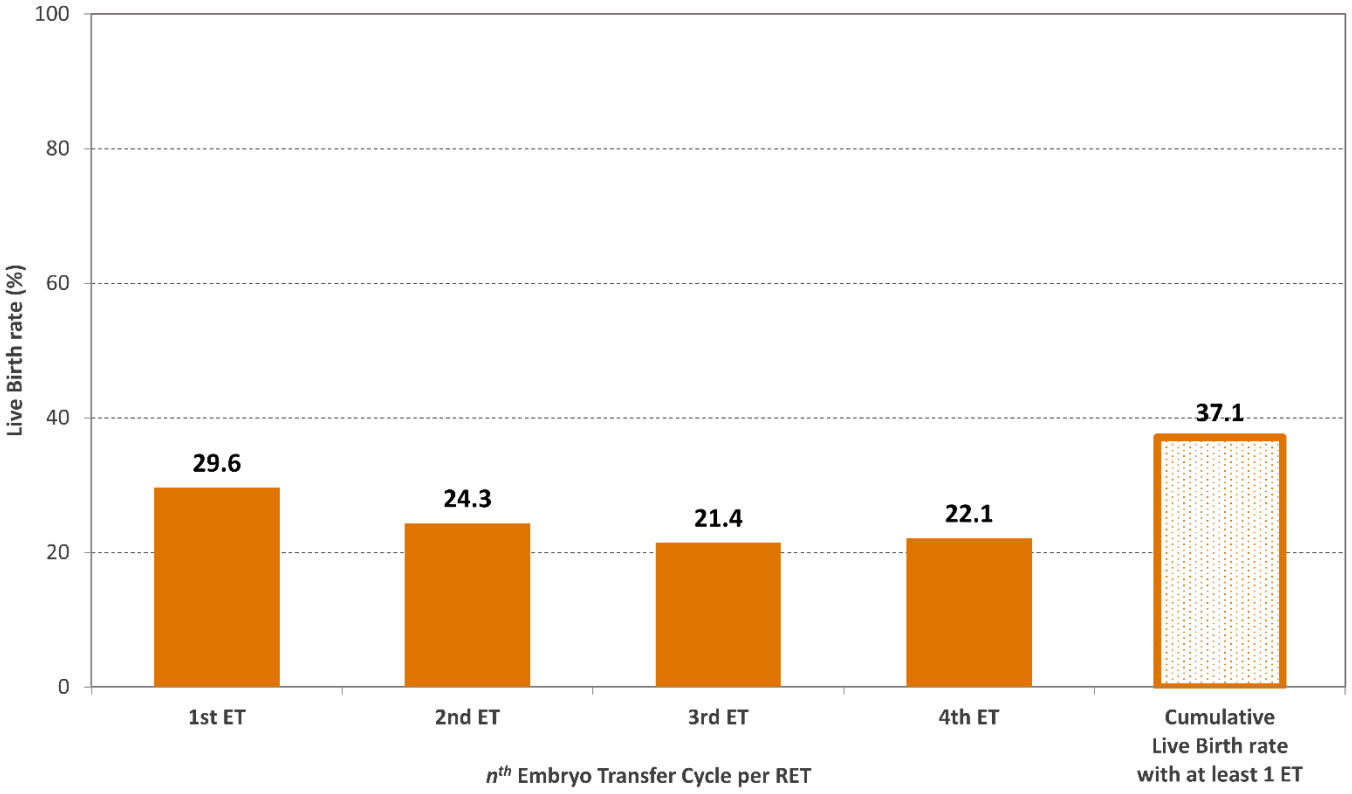

Figure 4: Embryo transfer-specific and cumulative live birth rate in autologous IVF cycles, per oocyte retrieval, CARTR Plus 2013-2018. An nth embryo transfer (ET) cycle was defined as each subsequent ET cycle resulting from a single oocyte retrieval numbered according to their transfer cycle start date; only ET cycles within 1 year of their respective oocyte retrieval cycle were included. Live birth rates at each nth ET was defined as the number of live births resulting from the nth ET cycle per oocyte retrieval divided by the number of nth ET cycles. The cumulative live birth rate was defined as the number of oocyte retrievals resulting in at least 1 live birth within 1 year of the oocyte retrieval divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.

Accessibility link: For the long description of Figure 4, see page 9

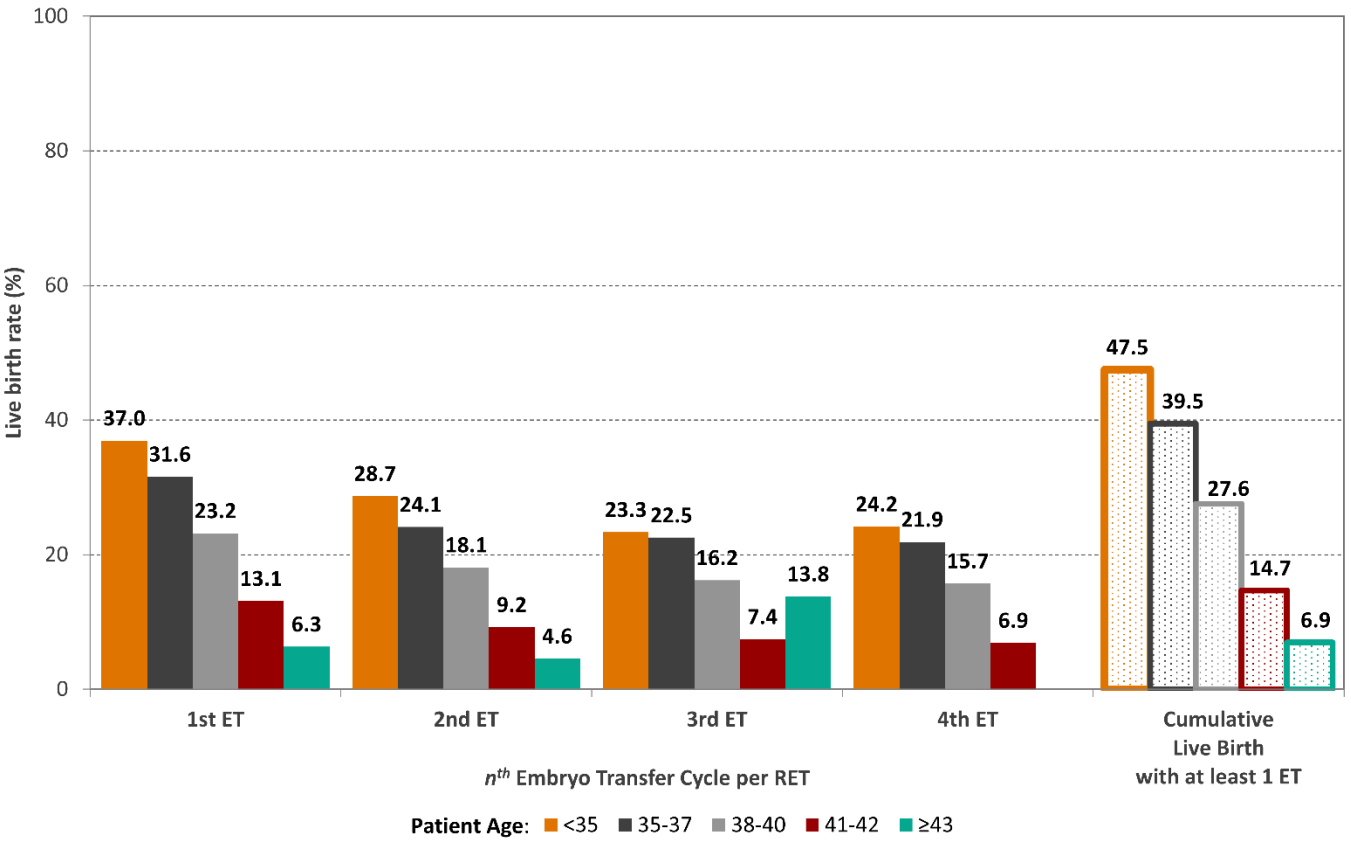

Figure 5: Embryo transfer-specific and cumulative live birth rate in autologous IVF cycles, per oocyte retrieval, by patient age at oocyte retrieval, CARTR Plus 2013-2018. An nth embryo transfer (ET) cycle was defined as each subsequent ET cycle resulting from a single oocyte retrieval numbered according to their transfer cycle start date; only ET cycles within 1 year of their respective oocyte retrieval cycle were included. Live birth rates at each nth ET was defined as the number of live births resulting from the nth ET cycle per oocyte retrieval divided by the number of nth ET cycles. The cumulative live birth rate was defined as the number of oocyte retrievals resulting in at least 1 live birth within 1 year of the oocyte retrieval divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.

Accessibility link: For the long description of Figure 5, see page 10

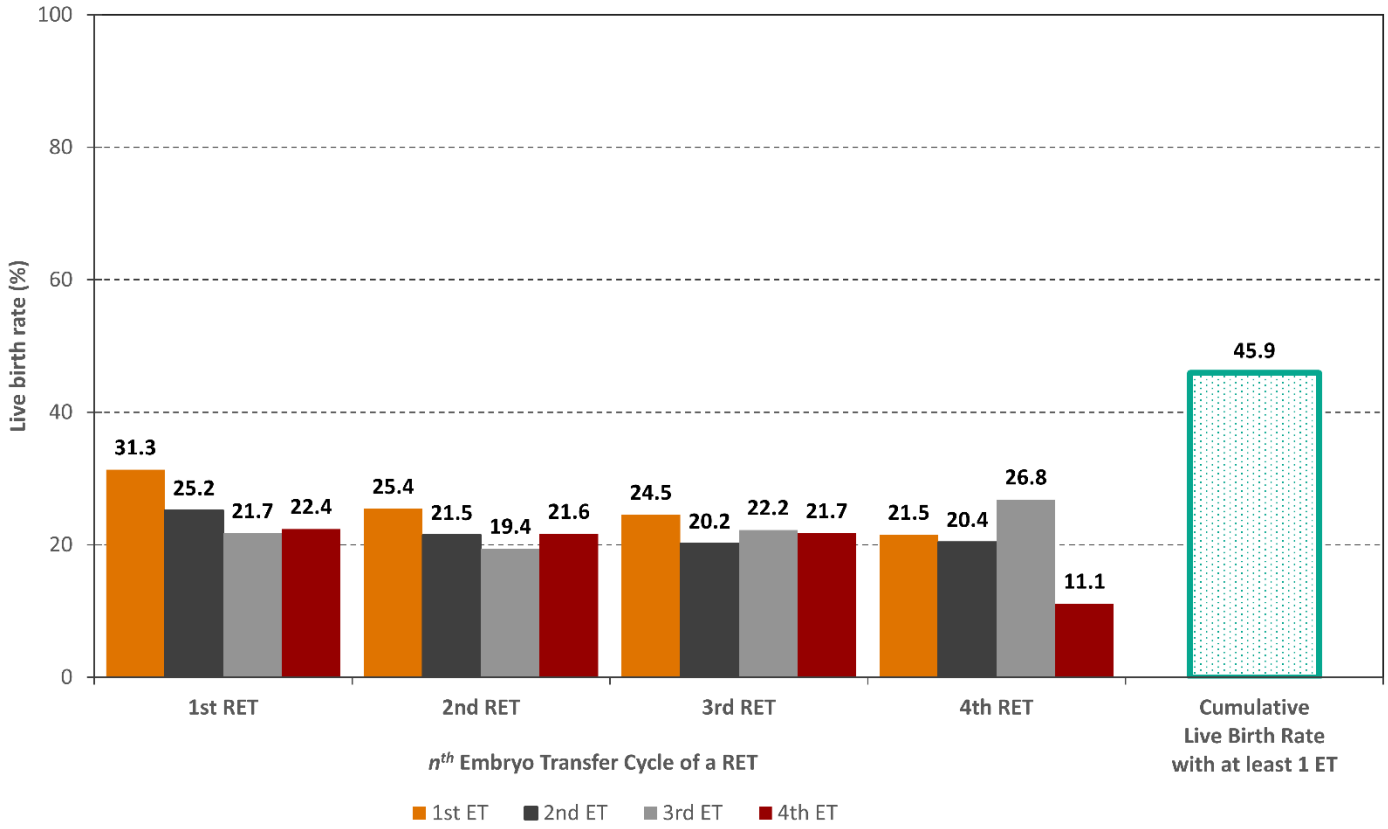

Figure 6: Embryo transfer-specific and cumulative live birth rate in autologous IVF cycles, per patient, CARTR Plus 2013-2018. An nth oocyte retrieval (RET) was defined per patient, where each subsequent oocyte retrieval cycle was numbered according to their cycle start date. An nth embryo transfer (ET) cycle was defined as each subsequent ET cycle resulting from a single oocyte retrieval numbered according to their transfer cycle start date; only ET cycles within 1 year of their respective oocyte retrieval cycle were included. Live birth rates at each nth ET was defined as the number of live births resulting from the nth ET cycle per oocyte retrieval divided by the number of nth ET cycles. The cumulative live birth rate was defined as the number of oocyte retrievals resulting in at least 1 live birth within 1 year of the oocyte retrieval divided by the total number of oocyte retrieval cycles that had at least 1 fresh or frozen embryo transfer.

Accessibility link: For the long description of Figure 6, see page 10

Accessibility Links – Long Descriptions

Figure 1 is a bar graph with the y-axis representing the clinical pregnancy rate, expressed as a percent per oocyte retrieval cycle. Four bars on the x-axis present the embryo transfer-specific clinical pregnancy rate at each nth embryo transfer cycle, per oocyte retrieval.
40.2% of oocyte retrievals resulted in a clinical pregnancy from the first embryo transfer; clinical pregnancy rate moderately decreased with each subsequent embryo transfer to 33.6% by the fourth embryo transfer. Data are summarized in Table 1.The fifth bar presents the overall cumulative clinical pregnancy rate per oocyte retrievals with at least one embryo transfer (49.6%)

Table 1: Embryo transfer-specific clinical pregnancy rates in autologous IVF cycles, per oocyte retrieval, CARTR Plus 2013-2019

	1st ET	**2nd ET**	**3rd ET**	**4th ET**
Clinical Pregnancy Rate (%)	40.2	37.6	34.9	33.6

Return to Figure 1 on page 2

Figure 2 is a clustered bar graph with the y-axis representing the clinical pregnancy rate, expressed as a percent per oocyte retrieval cycle. There are five clusters of bars on the x-axis. Each cluster consists of five bars, with each bar representing groups of patient age at oocyte retrieval, and each cluster representing the nth embryo transfer per oocyte retrieval. The five age groups are: less than 35 years, 35 to 37 years, 38 to 40 years, 41 to 42 years, and greater than or equal to 43 years. The first four clusters present the embryo transfer-specific clinical pregnancy rate at the first, second, third, and fourth embryo transfer cycle, per oocyte retrieval, for each patient age group. The final cluster presents the overall cumulative clinical pregnancy rate per oocyte retrieval with at least one embryo transfer, for each patient age group. Data are summarized in Table 2. The sample size for the clinical pregnancy rate at the fourth embryo transfer among patient greater than or equal to 43 years was too small to interpret accurately. Not surprisingly, the embryo transfer-specific and cumulative pregnancy rates decreased with increasing patient age.

Table 2: Embryo transfer-specific and cumulative clinical pregnancy rate in autologous IVF cycles, per oocyte retrieval, by patient age at oocyte retrieval, CARTR Plus 2013-2019.

Patient age at oocyte retrieval (years)	**Clinical pregnancy rate (%) at 1st ET**	**Clinical pregnancy rate (%) at 2nd ET**	**Clinical pregnancy rate (%) at 3rd ET**	**Clinical pregnancy rate (%) at 4th ET**	**Cumulative Pregnancy rate per oocyte retrievals with at least 1 ET (%)**
<35	47.2	42.3	36.8	35.9	59.8
35-37	42.3	37.2	36.3	35.2	52.1
38-40	34.9	31.4	29.6	24.7	40.9
41-42	24.0	22.3	20.9	6.1	27.1
≥43	14.0	13.7	22.6	50.0	15.3

Return to Figure 2 on page 3

Figure 3 is a clustered bar graph, where the y-axis represents the clinical pregnancy rate, expressed as a percent per oocyte retrieval cycle. There are five clusters of bars on the x-axis. The first four clusters consist of four bars, with each bar representing the nth embryo transfer cycle per oocyte retrieval, and each cluster representing the nth oocyte retrieval per patient. The first four clusters present the embryo transfer-specific clinical pregnancy rate at each nth embryo transfer cycle for each subsequent oocyte retrieval per patient. The final cluster consists of one bar, which represents the overall cumulative clinical pregnancy rate per patient with at least one embryo transfer (59.2%). Data are summarized in Table 3.

Table 3: Embryo transfer-specific clinical pregnancy rate in autologous IVF cycles, per patient, CARTR Plus 2013-2019

nth Embryo transfer cycle per oocyte retrieval	**Clinical pregnancy rate (%) for the first oocyte retrieval per patient**	**Clinical pregnancy rate (%) for the second oocyte retrieval per patient**	**Clinical pregnancy rate (%) for the third oocyte retrieval per patient**	**Clinical pregnancy rate (%) for the fourth oocyte retrieval per patient**
1st ET	42.1	36.2	34.4	30.0
2nd ET	38.6	34.5	32.2	32.1
3rd ET	35.6	31.1	33.9	31.0
4th ET	34.3	27.5	34.6	33.3

Return to Figure 3 on page 4

Figure 4 is a bar graph where the y-axis represents the live birth rate, expressed as a percent per oocyte retrieval cycle. There are five bars on the x-axis. The first four bars present the embryo transfer-specific live birth rate at each nth embryo transfer cycle, per oocyte retrieval. Data are summarized in Table 4. The final bar presents the overall cumulative live birth rate per oocyte retrievals with at least one embryo transfer (37.1%)

Table 4: Embryo transfer-specific live birth rate in autologous IVF cycles, per oocyte retrieval, CARTR Plus 2013-2018

	1st ET	**2nd ET**	**3rd ET**	**4th ET**
Live Birth Rate (%)	29.6	24.3	21.4	22.1

Return to Figure 4 on page 5

Figure 5 is a clustered bar graph where the y-axis represents the live birth rate, expressed as a percent per oocyte retrieval cycle. There are five clusters of bars on the x-axis. Each cluster consists of five bars, with each bar representing groupings of patient age at oocyte retrieval, and each cluster representing the nth embryo transfer per oocyte retrieval. The five age groups are: less than 35 years, 35 to 37 year, 38 to 40 year, 41 to 42 years, and greater than or equal to 43 years. The first four clusters present the embryo transfer-specific live birth rate at each nth embryo transfer cycle, per oocyte retrieval, for each patient age group. The final cluster presents the overall cumulative live birth rate per oocyte retrievals with at least one embryo transfer, for each patient age group. Data are summarized in Table 5.

Table 5: Embryo transfer-specific and cumulative live birth rate in autologous IVF cycles, per oocyte retrieval, by patient age at oocyte retrieval, CARTR Plus 2013-2018

Patient age at oocyte retrieval (years)	Live birth rate (%) at 1st ET	Live birth rate (%) at 2nd ET	Live birth rate (%) at 3rd ET	Live birth rate (%) at 4th ET	Cumulative live birth rate per oocyte retrievals with at least 1 ET (%)
<35	37.0	28.7	23.3	24.2	47.5
35-37	31.6	24.1	22.5	21.9	39.5
38-40	23.2	18.1	16.2	15.7	27.6
41-42	13.1	9.2	7.4	6.9	14.7
≥43	6.3	4.6	13.8	0.0	6.9

Return to Figure 5 on page 6

Figure 6 is a clustered bar graph where the y-axis represents the live birth rate, expressed as a percent per oocyte retrieval cycle. There are five clusters of bars on the x-axis. The first four clusters consist of four bars, with each bar representing the nth embryo transfer cycle per oocyte retrieval, and each cluster representing the nth oocyte retrieval per patient.

The first four clusters present the embryo transfer-specific live birth rate at each nth embryo transfer cycle for each subsequent oocyte retrieval per patient. The final cluster consists of one bar, which represents the overall cumulative live birth rate per patient with at least one embryo transfer (45.9%). Data are summarized in Table 6.

Table 6: Live birth rate at the nth embryo transfer cycle of the first oocyte retrieval per person

nth Embryo transfer cycle per oocyte retrieval	Live birth rate (%) for the first oocyte retrieval per patient	Live birth rate (%) for the second oocyte retrieval per patient	Live birth rate (%)for the third oocyte retrieval per patient	Live birth rate (%)for the fourth oocyte retrieval per patient
1st ET	31.3	25.4	24.5	21.5
2nd ET	25.2	21.5	20.2	20.4
3rd ET	21.7	19.4	22.2	26.8
4th ET	22.4	21.6	21.7	11.1

Return to Figure 6 on page 8