

ECLS Registry Report

International Summary

October, 2022

Report data through 2021



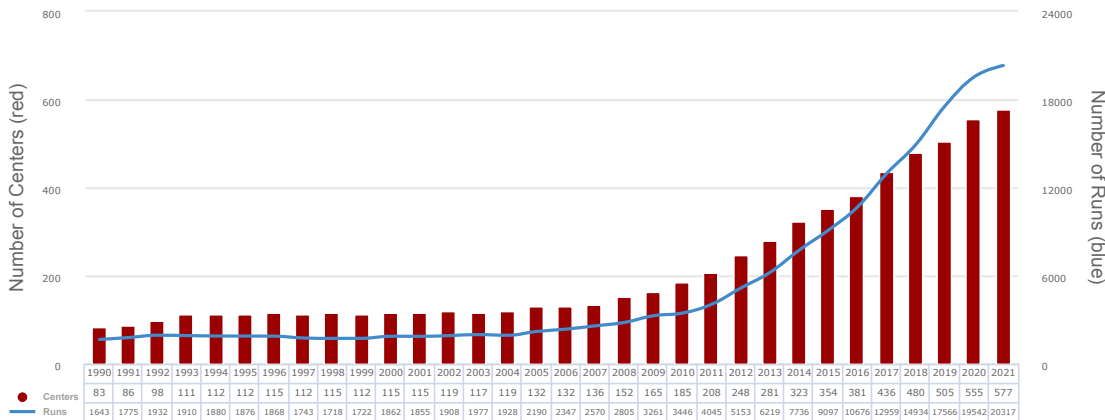
Extracorporeal Life Support Organization
3001 Miller Rd
Ann Arbor, MI 48103 USA

Overall Outcomes

	Total Runs	Survived ECLS		Survived to DC or Transfer	
Adult					
Pulmonary	44,454	29,504	66%	26,019	58%
Cardiac	39,659	23,763	59%	18,027	45%
ECPR	12,125	5,102	42%	3,684	30%
Pediatric					
Pulmonary	11,935	8,685	72%	7,295	61%
Cardiac	15,230	11,074	72%	8,293	54%
ECPR	6,182	3,647	58%	2,619	42%
Neonatal					
Pulmonary	34,239	29,972	87%	25,005	73%
Cardiac	10,233	7,085	69%	4,546	44%
ECPR	2,439	1,700	69%	1,042	42%
Total	176,496	120,532	68%	96,530	54%

Centers

Centers by year

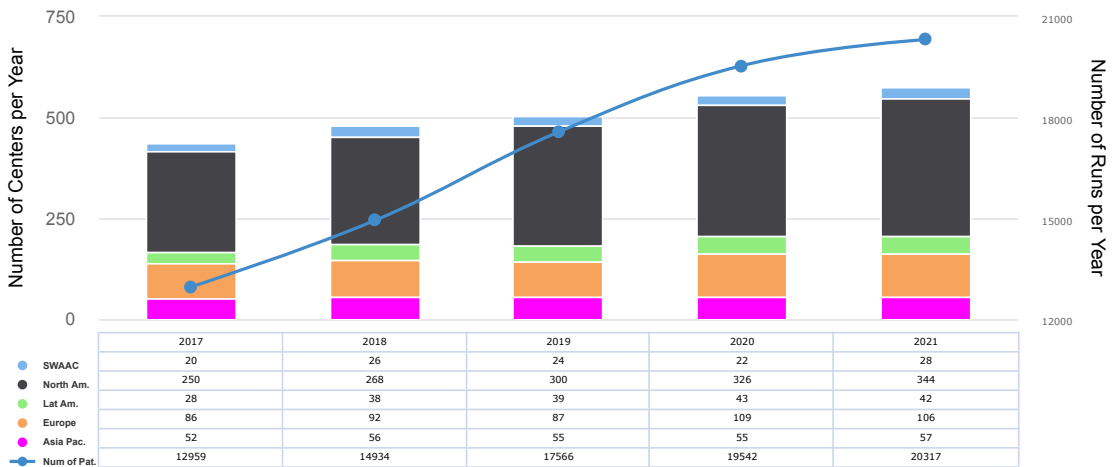


Overall Outcomes from 2017 to 2021

	Total Runs	Survived ECLS	Survived to DC or Transfer
Adult			
Pulmonary	30,717	19,964	64%
Cardiac	26,968	16,007	59%
ECPR	8,220	3,421	41%
Pediatric			
Pulmonary	3,646	2,788	76%
Cardiac	5,487	4,124	75%
ECPR	2,625	1,478	56%
Neonatal			
Pulmonary	3,971	3,285	82%
Cardiac	2,844	2,024	71%
ECPR	840	548	65%
Total	85,318	53,639	62%

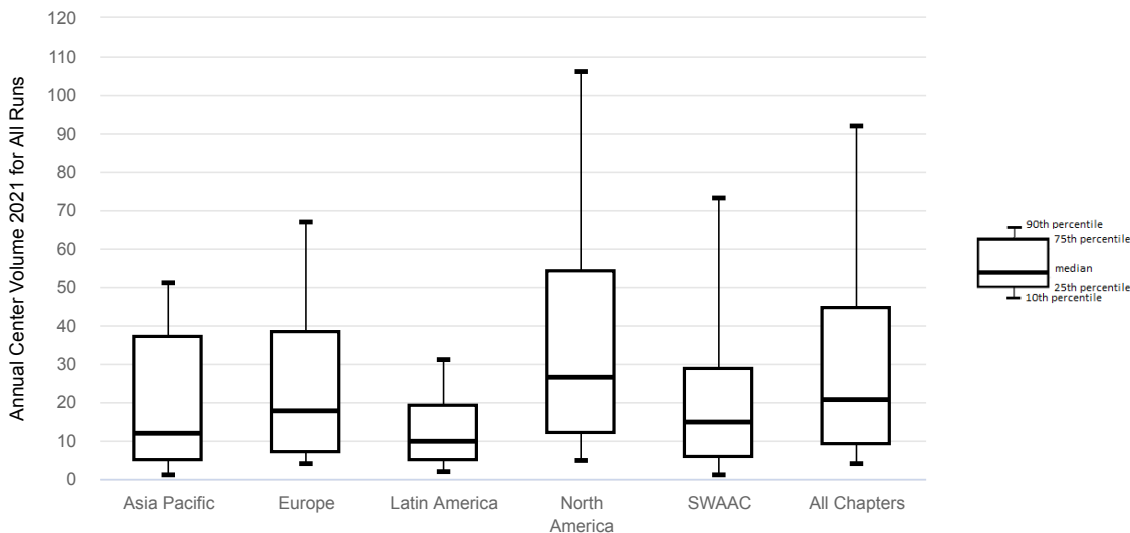
Centers by region

ELSO Centers and Run Counts

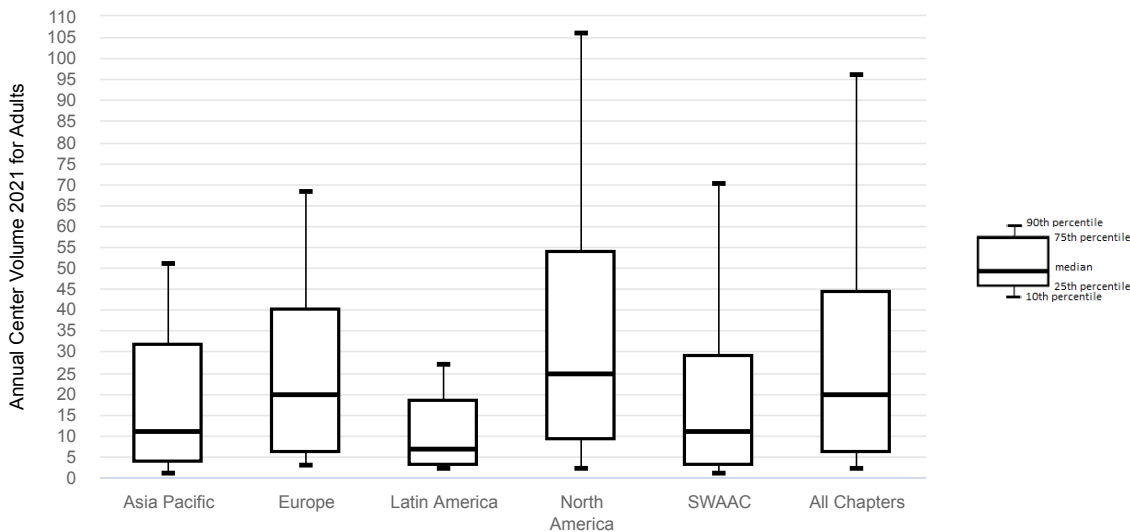


Annual Center Volume in 2022

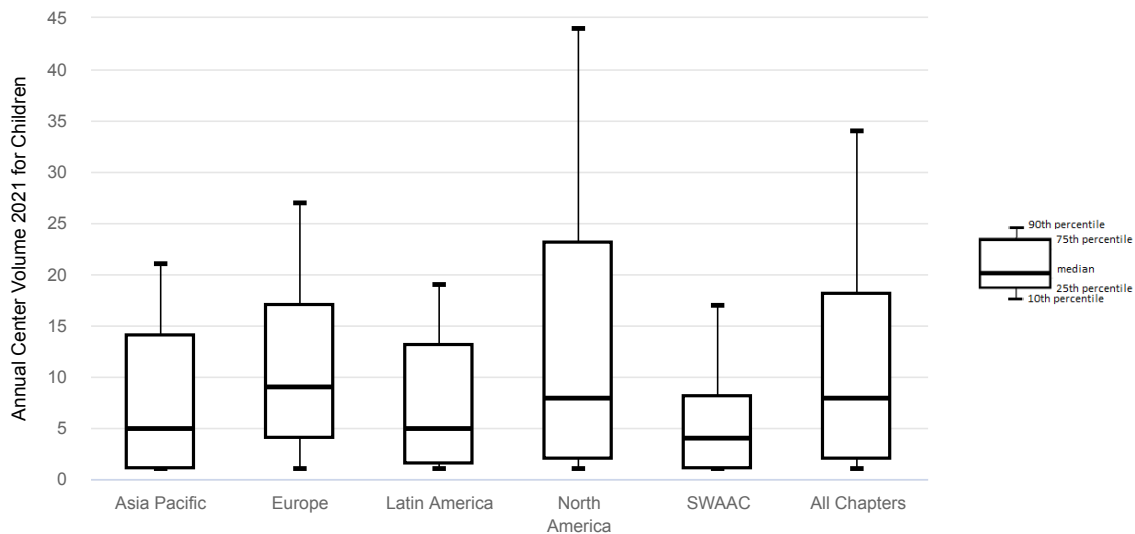
All Runs



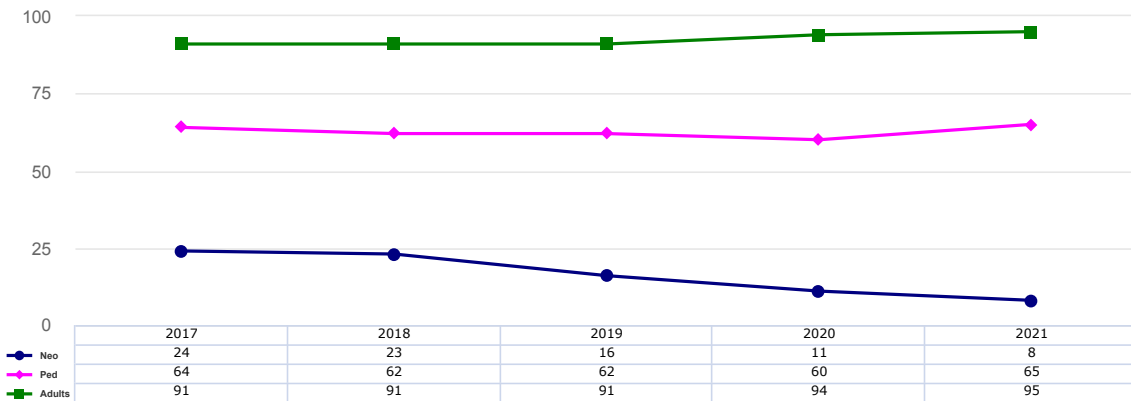
Adults



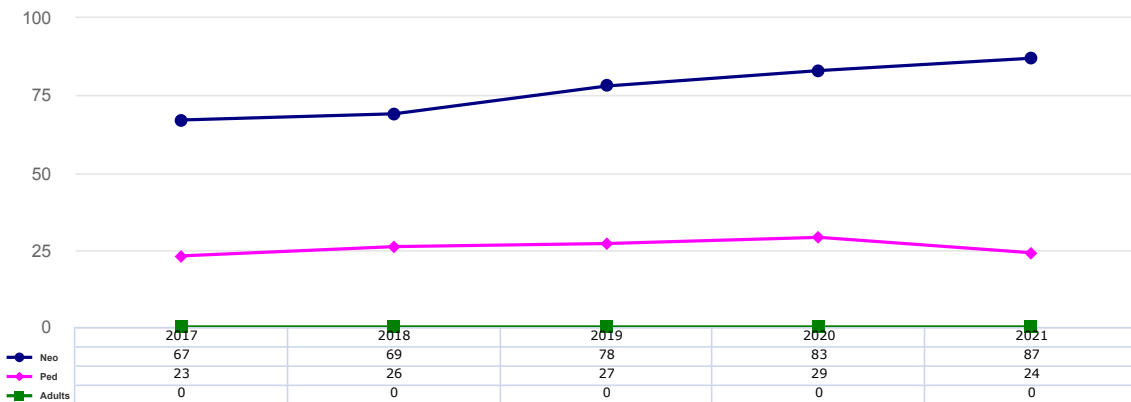
Children (Neonatal and Pediatric)



Proportion of VV Cannulation (Respiratory only)

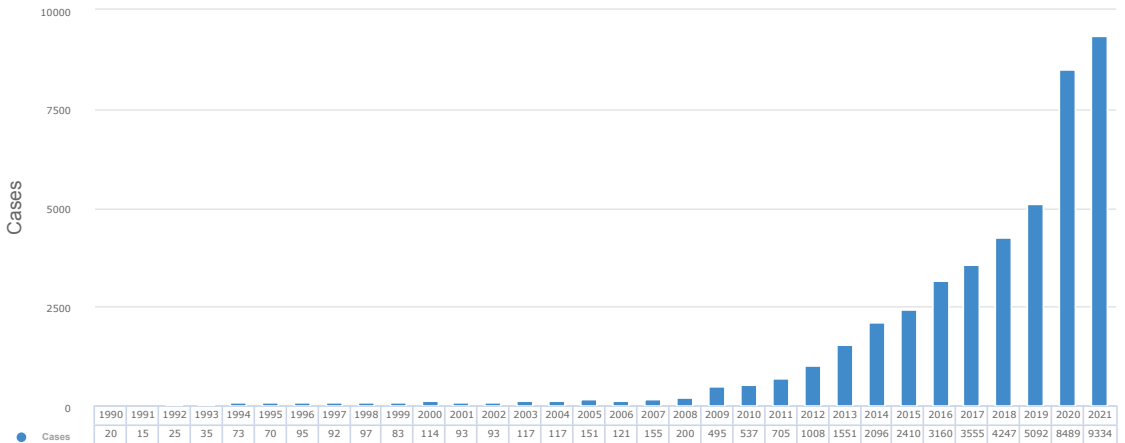


Proportion of respiratory ECMO support with carotid artery cannulation



Adult Respiratory (18 years and over)

Annual Respiratory Adult Runs



Adult Respiratory Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
<=1986	1	1	16	16	0	0%
1987	1	2	300	300	1	100%
1988	5	7	189	330	1	20%
1989	2	9	234	379	1	50%
1990	20	29	197	671	10	50%
1991	15	44	387	1,246	5	33%
1992	25	69	260	1,083	14	56%
1993	35	104	299	1,326	19	54%
1994	73	177	242	788	35	47%
1995	70	247	199	1,357	40	57%
1996	95	342	178	826	44	46%
1997	92	434	242	981	41	44%
1998	97	531	212	1,238	46	47%
1999	83	614	206	803	39	46%
2000	114	728	208	1,308	62	54%
2001	93	821	231	1,417	55	59%
2002	93	914	195	1,942	52	55%
2003	117	1,031	214	2,035	70	59%
2004	117	1,148	208	1,142	61	52%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2005	151	1,299	197	1,220	74	49%
2006	121	1,420	255	5,014	48	39%
2007	155	1,575	226	2,750	80	51%
2008	200	1,775	196	1,596	104	52%
2009	495	2,270	259	3,018	288	58%
2010	537	2,807	250	2,004	315	58%
2011	705	3,512	258	2,959	409	58%
2012	1,008	4,520	275	6,248	564	55%
2013	1,551	6,071	295	6,745	934	60%
2014	2,096	8,167	298	3,288	1,260	60%
2015	2,410	10,577	279	7,576	1,355	56%
2016	3,160	13,737	309	5,355	1,989	62%
2017	3,555	17,292	277	5,199	2,161	60%
2018	4,247	21,539	281	6,479	2,630	61%
2019	5,092	26,631	291	6,380	3,291	64%
2020	8,489	35,120	458	9,259	4,720	55%
2021	9,334	44,454	614	10,046	5,201	55%

Adult Respiratory Runs by Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Viral pneumonia	718	544	4,150	405	56%
Bacterial pneumonia	864	321	3,985	560	64%
Aspiration pneumonia	202	232	1,575	165	81%
ARDS, postop/trauma	10	149	361	6	60%
ARDS, not postop/trauma	5,146	420	9,259	3,043	59%
Acute resp failure, non-ARDS	799	303	4,264	491	61%
Other	21,612	446	10,046	12,508	57%

Note some runs are missing primary diagnoses

Initial Adult Respiratory Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	28,706	444	10,046	16,795	58%
VA	1,519	209	9,881	991	65%
VVA	263	333	3,077	102	38%
Other	82	434	2,609	37	45%
	0			0	%
VP	146	720	8,306	77	52%

Runs with Conversions - Adult Respiratory Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	370	590	5,311	130	35%
VA to VV	160	368	2,750	96	60%
Other	857	747	9,881	360	42%

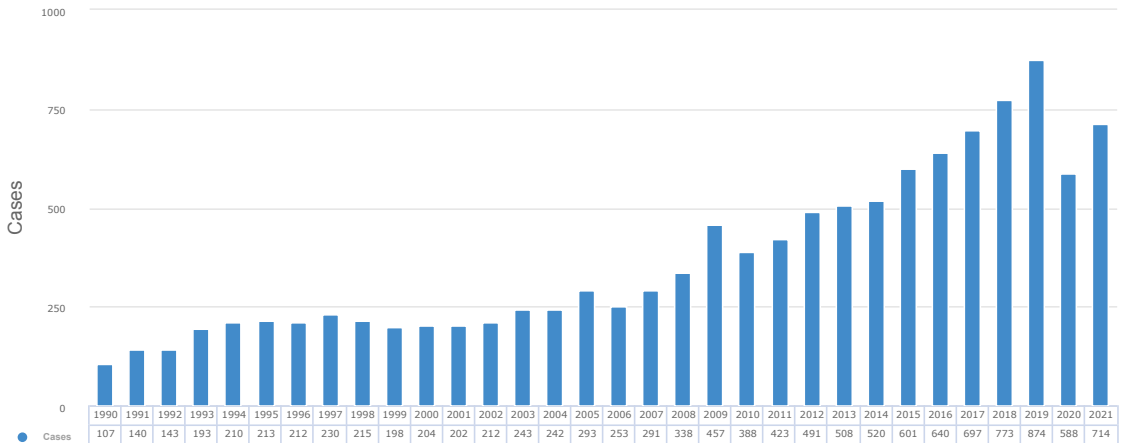
Adult Respiratory Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	5,534	18%	3,002	54%
Mechanical: Raceway rupture	2	0%	1	50%
Mechanical: Other tubing rupture	47	0.2%	22	47%
Mechanical: Pump Failure	439	1.4%	209	48%
Mechanical: Temperature Regulation Device Malfunction	25	0.1%	10	40%
Mechanical: Clots: hemofilter	325	1.1%	158	49%
Mechanical: Air in circuit	342	1.1%	170	50%
Mechanical: Cracks in pigtail connectors	11	0%	5	45%
Mechanical: Cannula problems	2,015	6.6%	938	47%
Mechanical: Circuit change	3,581	11.7%	1,945	54%
Mechanical: Clots and Air Emboli	71	0.2%	22	31%
Mechanical: Thrombosis/Clots: circuit component	1,444	4.7%	785	54%
Hemorrhagic: GI hemorrhage	1,824	5.9%	701	38%
Hemorrhagic: Cannulation site bleeding	328	1.1%	181	55%
Hemorrhagic: Surgical site bleeding	2,001	6.5%	989	49%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	368	1.2%	202	55%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	51	0.2%	17	33%
Hemorrhagic: Peripheral cannulation site bleeding	1,238	4%	567	46%
Hemorrhagic: Mediastinal cannulation site bleeding	107	0.3%	42	39%
Neurologic: Brain death	334	1.1%	0	0%
Neurologic: Seizures: clinically determined	180	0.6%	77	43%
Neurologic: Seizures Confirmed by EEG	86	0.3%	30	35%
Neurologic: CNS Infarction (US or CT or MRI)	413	1.3%	105	25%

	No Reported	% Reported	Survived	% Survived
Neurologic: CNS hemorrhage by US/CT	282	0.9%	83	29%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	339	1.1%	27	8%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	826	2.7%	156	19%
Neurologic: CNS diffuse ischemia (CT/MRI)	166	0.5%	26	16%
Neurologic: Neurosurgical intervention performed	50	0.2%	13	26%
Renal: Creatinine 1.5 - 3.0	3,296	10.7%	1,602	49%
Renal: Creatinine > 3.0	1,488	4.8%	673	45%
Renal: Renal Replacement Therapy Required	7,772	25.3%	3,267	42%
Cardiovascular: Inotropes on ECLS	715	2.3%	370	52%
Cardiovascular: CPR required	1,706	5.6%	396	23%
Cardiovascular: Myocardial stun by echo	21	0.1%	10	48%
Cardiovascular: Cardiac arrhythmia	2,908	9.5%	1,144	39%
Cardiovascular: Hypertension requiring vasodilators	82	0.3%	51	62%
Cardiovascular: PDA: L->R	1	0%	1	100%
Cardiovascular: Tamponade (blood)	270	0.9%	107	40%
Cardiovascular: Tamponade (not blood)	48	0.2%	16	33%
Pulmonary: Pneumothorax requiring treatment	3,282	10.7%	1,333	41%
Pulmonary: Pulmonary hemorrhage	1,050	3.4%	381	36%
Infectious: Culture proven infection (see Infections)	337	1.1%	186	55%
Infectious: WBC < 1,500	469	1.5%	155	33%
Metabolic: Glucose < 40	38	0.1%	11	29%
Metabolic: Glucose > 240	223	0.7%	122	55%
Metabolic: pH < 7.20	189	0.6%	57	30%
Metabolic: pH > 7.60	39	0.1%	25	64%
Metabolic: Hyperbilirubinemia	1,358	4.4%	366	27%
Metabolic: Moderate hemolysis	1,048	3.4%	543	52%
Metabolic: Severe hemolysis	706	2.3%	271	38%
Limb: Ischemia	274	0.9%	92	34%
Limb: Compartment Syndrome	63	0.2%	18	29%
Limb: Fasciotomy	143	0.5%	56	39%
Limb: Amputation	53	0.2%	27	51%

Pediatric Respiratory (>28 days and <18 years)

Annual Respiratory Pediatric Runs



Pediatric Respiratory Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
<=1986	20	20	182	450	6	30%
1987	14	34	204	595	6	42%
1988	38	72	245	648	13	34%
1989	50	122	215	612	29	58%
1990	107	229	270	853	49	45%
1991	140	369	293	1,256	73	52%
1992	143	512	298	933	70	48%
1993	193	705	286	1,144	102	52%
1994	210	915	286	1,156	122	58%
1995	213	1,128	290	1,440	111	52%
1996	212	1,340	296	1,483	126	59%
1997	230	1,570	280	1,258	139	60%
1998	215	1,785	252	1,015	127	59%
1999	198	1,983	247	1,332	120	60%
2000	204	2,187	263	2,437	110	53%
2001	202	2,389	240	2,239	96	47%
2002	212	2,601	230	1,108	130	61%
2003	243	2,844	226	881	145	59%
2004	242	3,086	237	1,222	141	58%
2005	293	3,379	243	1,280	156	53%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2006	253	3,632	272	1,326	132	52%
2007	291	3,923	258	1,309	164	56%
2008	338	4,261	256	1,987	178	52%
2009	457	4,718	288	2,968	258	56%
2010	388	5,106	269	2,140	230	59%
2011	423	5,529	276	2,465	252	59%
2012	491	6,020	254	2,781	306	62%
2013	508	6,528	305	6,862	315	62%
2014	520	7,048	259	1,932	321	61%
2015	601	7,649	309	7,503	363	60%
2016	640	8,289	303	4,286	382	59%
2017	697	8,986	314	4,557	471	67%
2018	773	9,759	317	6,011	521	67%
2019	874	10,633	289	2,670	634	72%
2020	588	11,221	305	4,564	389	66%
2021	714	11,935	326	5,090	508	71%

Pediatric Respiratory Runs by Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Viral pneumonia	158	321	1,385	121	76%
Bacterial pneumonia	153	381	3,903	111	72%
Pneumocystis pneumonia	6	763	1,493	3	50%
Aspiration pneumonia	39	223	1,724	29	74%
ARDS, postop/trauma	13	278	711	11	84%
ARDS, not postop/trauma	409	375	4,379	289	70%
Acute resp failure, non-ARDS	181	291	2,717	129	71%
Other	2,609	297	6,011	1,780	68%

Note some runs are missing primary diagnoses

Initial Pediatric Respiratory Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	2,317	336	6,011	1,681	72%
VA	1,281	258	4,564	825	64%
VVA	36	397	2,727	13	36%
Other	11	316	772	4	36%
VP	1	1	1	0	0%

Runs with Conversions - Pediatric Respiratory Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	112	495	3,903	58	51%
VA to VV	48	662	4,564	33	68%
Other	93	718	6,011	47	50%

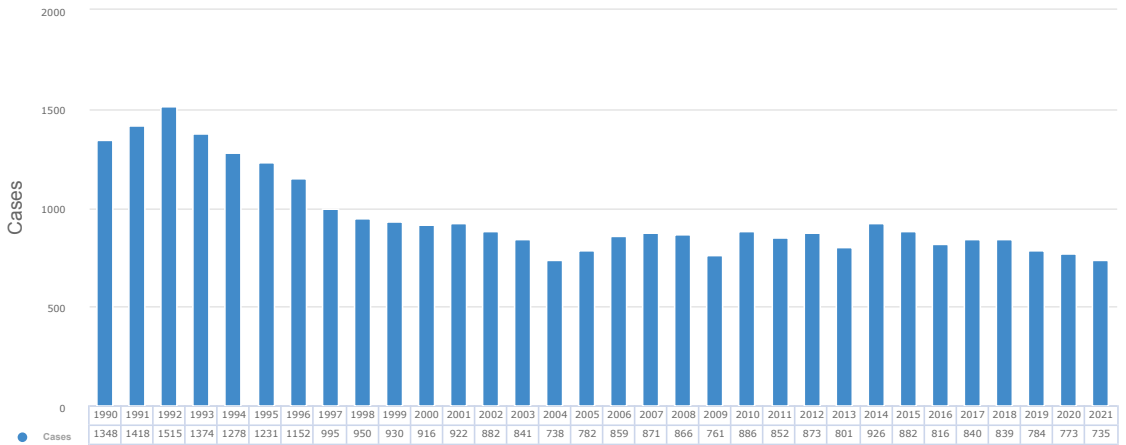
Pediatric Respiratory Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	331	9.1%	175	53%
Mechanical: Raceway rupture	5	0.1%	2	40%
Mechanical: Other tubing rupture	10	0.3%	3	30%
Mechanical: Pump Failure	41	1.1%	25	61%
Mechanical: Temperature Regulation Device Malfunction	10	0.3%	7	70%
Mechanical: Clots: hemofilter	199	5.5%	118	59%
Mechanical: Air in circuit	168	4.6%	98	58%
Mechanical: Cracks in pigtail connectors	17	0.5%	7	41%
Mechanical: Cannula problems	588	16.1%	382	65%
Mechanical: Circuit change	704	19.3%	453	64%
Mechanical: Clots and Air Emboli	29	0.8%	14	48%
Mechanical: Thrombosis/Clots: circuit component	684	18.8%	426	62%
Hemorrhagic: GI hemorrhage	135	3.7%	49	36%
Hemorrhagic: Cannulation site bleeding	153	4.2%	100	65%
Hemorrhagic: Surgical site bleeding	262	7.2%	149	57%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	367	10.1%	211	57%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	17	0.5%	5	29%
Hemorrhagic: Peripheral cannulation site bleeding	196	5.4%	129	66%
Hemorrhagic: Mediastinal cannulation site bleeding	65	1.8%	43	66%
Neurologic: Brain death	62	1.7%	0	0%
Neurologic: Seizures: clinically determined	62	1.7%	23	37%
Neurologic: Seizures Confirmed by EEG	95	2.6%	42	44%
Neurologic: CNS Infarction (US or CT or MRI)	116	3.2%	38	33%
Neurologic: CNS hemorrhage by US/CT	109	3%	37	34%

	No Reported	% Reported	Survived	% Survived
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	30	0.8%	7	23%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	69	1.9%	21	30%
Neurologic: CNS diffuse ischemia (CT/MRI)	52	1.4%	13	25%
Neurologic: Neurosurgical intervention performed	13	0.4%	5	38%
Renal: Creatinine 1.5 - 3.0	188	5.2%	98	52%
Renal: Creatinine > 3.0	56	1.5%	27	48%
Renal: Renal Replacement Therapy Required	1,029	28.2%	525	51%
Cardiovascular: Inotropes on ECLS	168	4.6%	102	61%
Cardiovascular: CPR required	222	6.1%	85	38%
Cardiovascular: Myocardial stun by echo	6	0.2%	4	67%
Cardiovascular: Cardiac arrhythmia	109	3%	50	46%
Cardiovascular: Hypertension requiring vasodilators	93	2.6%	73	78%
Cardiovascular: PDA: L->R	1	0%	0	0%
Cardiovascular: Tamponade (blood)	68	1.9%	45	66%
Cardiovascular: Tamponade (not blood)	7	0.2%	5	71%
Pulmonary: Pneumothorax requiring treatment	293	8%	150	51%
Pulmonary: Pulmonary hemorrhage	147	4%	59	40%
Infectious: Culture proven infection (see Infections)	73	2%	43	59%
Infectious: WBC < 1,500	61	1.7%	23	38%
Metabolic: Glucose < 40	5	0.1%	2	40%
Metabolic: Glucose > 240	56	1.5%	38	68%
Metabolic: pH < 7.20	58	1.6%	28	48%
Metabolic: pH > 7.60	13	0.4%	12	92%
Metabolic: Hyperbilirubinemia	190	5.2%	50	26%
Metabolic: Moderate hemolysis	505	13.9%	282	56%
Metabolic: Severe hemolysis	344	9.4%	173	50%
Limb: Ischemia	24	0.7%	10	42%
Limb: Compartment Syndrome	11	0.3%	4	36%
Limb: Fasciotomy	25	0.7%	15	60%
Limb: Amputation	12	0.3%	6	50%

Neonatal Respiratory (0-28 days)

Annual Respiratory Neonatal Runs



Neonatal Respiratory Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
<=1986	818	818	118	840	657	80%
1987	651	1,469	121	411	558	85%
1988	1,015	2,484	131	601	841	82%
1989	1,119	3,603	134	500	917	81%
1990	1,348	4,951	144	672	1,095	81%
1991	1,418	6,369	153	827	1,141	80%
1992	1,515	7,884	155	2,832	1,180	77%
1993	1,374	9,258	158	959	1,093	79%
1994	1,278	10,536	161	936	972	76%
1995	1,231	11,767	163	794	930	75%
1996	1,152	12,919	167	1,176	841	73%
1997	995	13,914	173	1,131	742	74%
1998	950	14,864	187	1,093	681	71%
1999	930	15,794	183	812	672	72%
2000	916	16,710	188	936	692	75%
2001	922	17,632	190	949	655	71%
2002	882	18,514	189	944	624	70%
2003	841	19,355	195	1,001	554	65%
2004	738	20,093	196	956	481	65%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2005	782	20,875	204	1,006	531	67%
2006	859	21,734	207	1,033	576	67%
2007	871	22,605	198	1,229	583	66%
2008	866	23,471	212	1,133	580	66%
2009	761	24,232	211	1,327	522	68%
2010	886	25,118	205	2,549	612	69%
2011	852	25,970	223	2,745	563	66%
2012	873	26,843	227	3,435	611	69%
2013	801	27,644	213	1,908	537	67%
2014	926	28,570	221	2,305	644	69%
2015	882	29,452	214	1,662	563	63%
2016	816	30,268	227	1,733	536	65%
2017	840	31,108	212	2,286	594	70%
2018	839	31,947	228	2,693	609	72%
2019	784	32,731	218	2,197	554	70%
2020	773	33,504	229	2,235	543	70%
2021	735	34,239	220	2,261	521	70%

Neonatal Respiratory Runs by Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
CDH	1,252	324	2,261	735	58%
MAS	594	152	2,286	542	91%
PPHN/PFC	275	157	937	201	73%
RDS	30	192	522	23	76%
Sepsis	80	163	686	42	52%
Pneumonia	13	338	982	7	53%
Air Leak Syndrome	6	205	335	4	66%
Other	1,681	183	2,693	1,235	73%

Note some runs are missing primary diagnoses

Initial Neonatal Respiratory Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	681	174	1,017	536	78%
VA	3,270	231	2,693	2,270	69%
VVA	15	229	937	11	73%
Other	5	175	341	4	80%

Runs with Conversions - Neonatal Respiratory Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	58	249	887	27	46%
VA to VV	15	710	2,693	8	53%
Other	13	299	982	5	38%

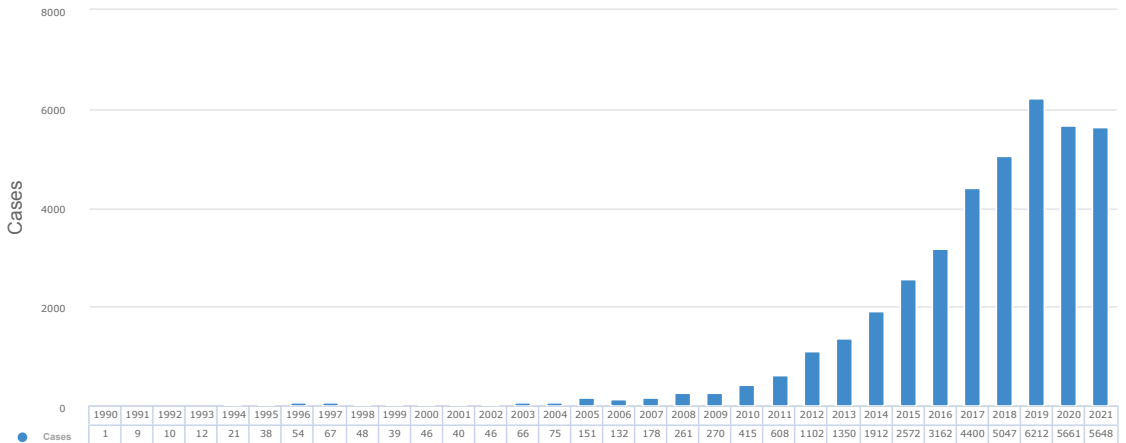
Neonatal Respiratory Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	241	6.1%	122	51%
Mechanical: Raceway rupture	2	0.1%	2	100%
Mechanical: Other tubing rupture	7	0.2%	5	71%
Mechanical: Pump Failure	33	0.8%	12	36%
Mechanical: Temperature Regulation Device Malfunction	13	0.3%	6	46%
Mechanical: Clots: hemofilter	199	5%	82	41%
Mechanical: Air in circuit	126	3.2%	66	52%
Mechanical: Cracks in pigtail connectors	7	0.2%	4	57%
Mechanical: Cannula problems	580	14.6%	354	61%
Mechanical: Circuit change	739	18.6%	338	46%
Mechanical: Clots and Air Emboli	63	1.6%	42	67%
Mechanical: Thrombosis/Clots: circuit component	1,144	28.8%	621	54%
Hemorrhagic: GI hemorrhage	58	1.5%	24	41%
Hemorrhagic: Cannulation site bleeding	141	3.6%	96	68%
Hemorrhagic: Surgical site bleeding	249	6.3%	110	44%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	389	9.8%	216	56%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	29	0.7%	16	55%
Hemorrhagic: Peripheral cannulation site bleeding	170	4.3%	119	70%
Hemorrhagic: Mediastinal cannulation site bleeding	23	0.6%	9	39%
Neurologic: Brain death	4	0.1%	0	0%
Neurologic: Seizures: clinically determined	83	2.1%	43	52%
Neurologic: Seizures Confirmed by EEG	215	5.4%	109	51%
Neurologic: CNS Infarction (US or CT or MRI)	97	2.4%	41	42%
Neurologic: CNS hemorrhage by US/CT	190	4.8%	83	44%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	114	2.9%	49	43%

	No Reported	% Reported	Survived	% Survived
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	138	3.5%	49	36%
Neurologic: CNS diffuse ischemia (CT/MRI)	18	0.5%	3	17%
Neurologic: Neurosurgical intervention performed	1	0%	1	100%
Renal: Creatinine 1.5 - 3.0	108	2.7%	43	40%
Renal: Creatinine > 3.0	9	0.2%	2	22%
Renal: Renal Replacement Therapy Required	810	20.4%	405	50%
Cardiovascular: Inotropes on ECLS	258	6.5%	147	57%
Cardiovascular: CPR required	88	2.2%	28	32%
Cardiovascular: Myocardial stun by echo	9	0.2%	3	33%
Cardiovascular: Cardiac arrhythmia	144	3.6%	79	55%
Cardiovascular: Hypertension requiring vasodilators	60	1.5%	36	60%
Cardiovascular: PDA: R->L	21	0.5%	11	52%
Cardiovascular: PDA: L->R	22	0.6%	14	64%
Cardiovascular: PDA: bidirectional	28	0.7%	14	50%
Cardiovascular: PDA: unknown	1	0%	0	0%
Cardiovascular: Tamponade (blood)	45	1.1%	24	53%
Cardiovascular: Tamponade (not blood)	15	0.4%	5	33%
Pulmonary: Pneumothorax requiring treatment	154	3.9%	77	50%
Pulmonary: Pulmonary hemorrhage	135	3.4%	50	37%
Infectious: Culture proven infection (see Infections)	22	0.6%	8	36%
Infectious: WBC < 1,500	15	0.4%	6	40%
Metabolic: Glucose < 40	18	0.5%	12	67%
Metabolic: Glucose > 240	65	1.6%	48	74%
Metabolic: pH < 7.20	72	1.8%	36	50%
Metabolic: pH > 7.60	31	0.8%	20	65%
Metabolic: Hyperbilirubinemia	383	9.6%	194	51%
Metabolic: Moderate hemolysis	431	10.9%	256	59%
Metabolic: Severe hemolysis	255	6.4%	119	47%
Limb: Ischemia	13	0.3%	2	15%
Limb: Fasciotomy	1	0%	1	100%

Adult Cardiac (18 years and over)

Annual Cardiac Adult Runs



Adult Cardiac Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
<=1986	1	1	136	136	0	0%
1988	3	4	231	370	0	0%
1989	2	6	63	102	1	50%
1990	1	7	147	147	0	0%
1991	9	16	134	382	1	11%
1992	10	26	82	303	2	20%
1993	12	38	95	214	2	16%
1994	21	59	117	622	6	28%
1995	38	97	101	438	18	47%
1996	54	151	93	564	16	29%
1997	67	218	85	900	28	41%
1998	48	266	115	786	12	25%
1999	39	305	105	256	13	33%
2000	46	351	102	431	17	36%
2001	40	391	85	259	14	35%
2002	46	437	102	404	17	36%
2003	66	503	130	576	23	34%
2004	75	578	106	733	28	37%
2005	151	729	116	663	48	31%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2006	132	861	142	965	63	47%
2007	178	1,039	116	761	70	39%
2008	261	1,300	126	1,296	123	47%
2009	270	1,570	127	871	111	41%
2010	415	1,985	138	2,105	182	43%
2011	608	2,593	139	4,570	225	37%
2012	1,102	3,695	150	2,950	455	41%
2013	1,350	5,045	159	3,066	548	40%
2014	1,912	6,957	161	6,539	810	42%
2015	2,572	9,529	152	2,849	1,098	42%
2016	3,162	12,691	154	2,941	1,390	43%
2017	4,400	17,091	160	6,359	1,916	43%
2018	5,047	22,138	159	4,085	2,284	45%
2019	6,212	28,350	161	4,783	3,012	48%
2020	5,661	34,011	162	2,029	2,701	47%
2021	5,648	39,659	172	6,434	2,793	49%

Adult Cardiac Runs by Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Congenital Defect	176	184	867	83	47%
Cardiac Arrest	468	124	1,253	183	39%
Cardiogenic Shock	9,115	175	6,434	4,179	45%
Cardiomyopathy	153	201	1,990	84	54%
Myocarditis	167	192	956	123	73%
Other	15,212	158	6,359	7,365	48%

Note some runs are missing primary diagnoses

Adult Cardiac Runs by Congenital Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Left to right shunt (ASD/VSD/PDA/AV canal/AVSD/ECD)	65	190	867	25	38%
Left-sided obstructive (aortic stenosis/mitral stenosis/coarctation)	45	186	618	21	46%
Hypoplastic left heart	6	290	553	3	50%
Right-sided obstructive (pulmonary stenosis/pulmonary or tricuspid atresia)	6	216	340	1	16%
Cyanotic incr. pulmonary flow (truncus arteriosus/TGA/TGV)	7	222	846	4	57%
Cyanotic decr. pulmonary flow (TOF/DORV/Ebsteins)	14	136	281	12	85%

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Other	33	156	840	17	51%

Note some runs are missing primary diagnoses

Initial Adult Cardiac Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	480	242	1,990	229	47%
VA	25,508	160	6,434	12,012	47%
VVA	536	206	1,787	230	42%
Other	355	194	3,384	196	55%
Unknown	3	154	230	1	33%
VP	86	190	1,291	38	44%

Runs with Conversions - Adult Cardiac Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	37	317	1,724	11	29%
VA to VV	837	354	2,709	397	47%
Other	969	334	3,384	391	40%

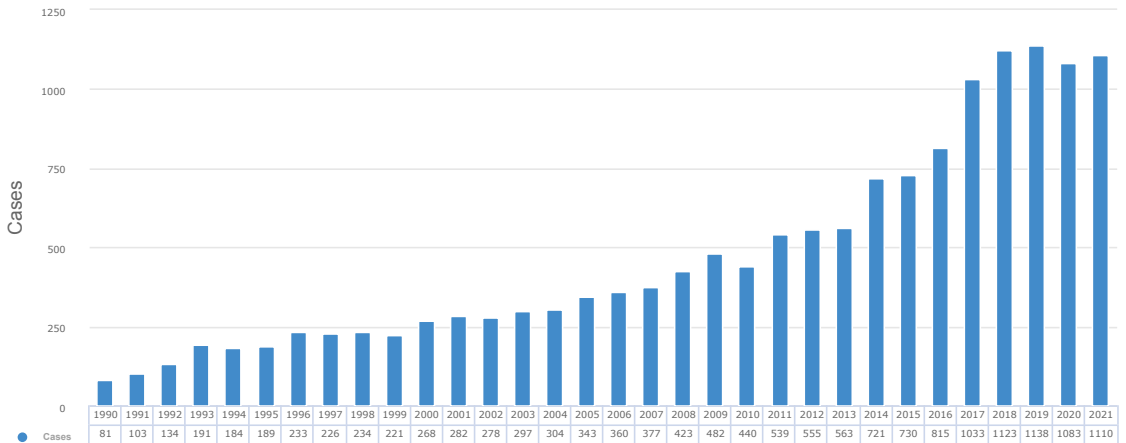
Adult Cardiac Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	847	3.1%	342	40%
Mechanical: Raceway rupture	1	0%	0	0%
Mechanical: Other tubing rupture	16	0.1%	5	31%
Mechanical: Pump Failure	148	0.5%	53	36%
Mechanical: Temperature Regulation Device Malfunction	9	0%	5	56%
Mechanical: Clots: hemofilter	96	0.4%	39	41%
Mechanical: Air in circuit	217	0.8%	51	24%
Mechanical: Cracks in pigtail connectors	11	0%	5	45%
Mechanical: Cannula problems	869	3.2%	360	41%
Mechanical: Circuit change	801	3%	305	38%
Mechanical: Clots and Air Emboli	31	0.1%	13	42%
Mechanical: Thrombosis/Clots: circuit component	1,093	4.1%	445	41%
Hemorrhagic: GI hemorrhage	1,139	4.2%	303	27%
Hemorrhagic: Cannulation site bleeding	677	2.5%	248	37%
Hemorrhagic: Surgical site bleeding	3,640	13.5%	1,280	35%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	392	1.5%	115	29%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	66	0.2%	12	18%
Hemorrhagic: Peripheral cannulation site bleeding	1,678	6.2%	754	45%
Hemorrhagic: Mediastinal cannulation site bleeding	1,016	3.8%	348	34%
Neurologic: Brain death	322	1.2%	0	0%
Neurologic: Seizures: clinically determined	186	0.7%	56	30%
Neurologic: Seizures Confirmed by EEG	125	0.5%	34	27%
Neurologic: CNS Infarction (US or CT or MRI)	856	3.2%	193	23%

	No Reported	% Reported	Survived	% Survived
Neurologic: CNS hemorrhage by US/CT	193	0.7%	24	12%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	129	0.5%	14	11%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	318	1.2%	57	18%
Neurologic: CNS diffuse ischemia (CT/MRI)	309	1.1%	36	12%
Neurologic: Neurosurgical intervention performed	31	0.1%	5	16%
Renal: Creatinine 1.5 - 3.0	3,589	13.3%	1,401	39%
Renal: Creatinine > 3.0	1,937	7.2%	685	35%
Renal: Renal Replacement Therapy Required	7,286	27%	2,367	32%
Cardiovascular: Inotropes on ECLS	1,128	4.2%	450	40%
Cardiovascular: CPR required	556	2.1%	91	16%
Cardiovascular: Myocardial stun by echo	81	0.3%	24	30%
Cardiovascular: Cardiac arrhythmia	3,822	14.2%	1,376	36%
Cardiovascular: Hypertension requiring vasodilators	95	0.4%	57	60%
Cardiovascular: PDA: L->R	2	0%	0	0%
Cardiovascular: Tamponade (blood)	997	3.7%	354	36%
Cardiovascular: Tamponade (not blood)	85	0.3%	31	36%
Pulmonary: Pneumothorax requiring treatment	417	1.5%	148	35%
Pulmonary: Pulmonary hemorrhage	421	1.6%	106	25%
Infectious: Culture proven infection (see Infections)	284	1.1%	116	41%
Infectious: WBC < 1,500	325	1.2%	127	39%
Metabolic: Glucose < 40	42	0.2%	5	12%
Metabolic: Glucose > 240	300	1.1%	134	45%
Metabolic: pH < 7.20	247	0.9%	45	18%
Metabolic: pH > 7.60	89	0.3%	49	55%
Metabolic: Hyperbilirubinemia	1,757	6.5%	444	25%
Metabolic: Moderate hemolysis	425	1.6%	152	36%
Metabolic: Severe hemolysis	324	1.2%	88	27%
Limb: Ischemia	1,111	4.1%	344	31%
Limb: Compartment Syndrome	229	0.8%	56	24%
Limb: Fasciotomy	719	2.7%	233	32%
Limb: Amputation	194	0.7%	83	43%

Pediatric Cardiac (>28 days and <18 years)

Annual Cardiac Pediatric Runs



Pediatric Cardiac Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
<=1986	33	33	87	196	14	42%
1987	34	67	100	312	18	52%
1988	42	109	113	353	15	35%
1989	61	170	125	293	27	44%
1990	81	251	129	544	31	38%
1991	103	354	115	432	47	45%
1992	134	488	138	547	45	33%
1993	191	679	143	1,080	81	42%
1994	184	863	136	720	64	34%
1995	189	1,052	151	984	67	35%
1996	233	1,285	135	721	91	39%
1997	226	1,511	159	864	92	40%
1998	234	1,745	163	1,183	97	41%
1999	221	1,966	149	1,029	93	42%
2000	268	2,234	140	871	128	47%
2001	282	2,516	156	1,490	121	42%
2002	278	2,794	162	1,246	131	47%
2003	297	3,091	165	987	152	51%
2004	304	3,395	163	1,157	139	45%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2005	343	3,738	165	1,207	187	54%
2006	360	4,098	147	1,260	191	53%
2007	377	4,475	170	963	193	51%
2008	423	4,898	150	910	217	51%
2009	482	5,380	169	3,456	313	64%
2010	440	5,820	146	1,259	227	51%
2011	539	6,359	159	3,605	304	56%
2012	555	6,914	162	2,452	316	56%
2013	563	7,477	200	6,798	310	55%
2014	721	8,198	171	3,506	390	54%
2015	730	8,928	181	2,564	423	57%
2016	815	9,743	173	2,977	471	57%
2017	1,033	10,776	184	3,408	639	61%
2018	1,123	11,899	186	6,194	661	58%
2019	1,138	13,037	165	3,572	669	58%
2020	1,083	14,120	162	4,941	657	60%
2021	1,110	15,230	176	3,224	672	60%

Pediatric Cardiac Runs by Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Congenital Defect	1,616	165	3,549	934	57%
Cardiac Arrest	110	133	898	59	53%
Cardiogenic Shock	661	172	3,199	388	58%
Cardiomyopathy	76	222	2,182	42	55%
Myocarditis	109	208	1,746	98	89%
Other	2,704	180	6,194	1,654	61%

Note some runs are missing primary diagnoses

Pediatric Cardiac Runs by Congenital Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Left to right shunt (ASD/VSD/PDA/AV canal/AVSD/ECD)	314	166	902	177	56%
Left-sided obstructive (aortic stenosis/mitral stenosis/coarctation)	145	155	2,538	95	65%
Hypoplastic left heart	243	168	3,379	117	48%
Right-sided obstructive (pulmonary stenosis/pulmonary or tricuspid atresia)	57	143	541	39	68%
Cyanotic incr. pulmonary flow (truncus arteriosus/TGA/TGV)	46	168	551	22	47%

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Cyanotic incr. pulm. congestion (TAP VR/P APVR)	55	226	3,224	21	38%
Cyanotic decr. pulmonary flow (TOF/DORV/Ebsteins)	281	155	1,752	162	57%
Other	475	166	3,549	301	63%

Note some runs are missing primary diagnoses

Initial Pediatric Cardiac Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	52	197	1,374	31	59%
VA	5,290	172	6,194	3,187	60%
VVA	98	221	1,548	59	60%
Other	45	340	3,242	20	44%
VP	2	192	268	1	50%

Runs with Conversions - Pediatric Cardiac Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	10	122	307	7	70%
VA to VV	65	536	3,549	36	55%
Other	99	461	3,371	43	43%

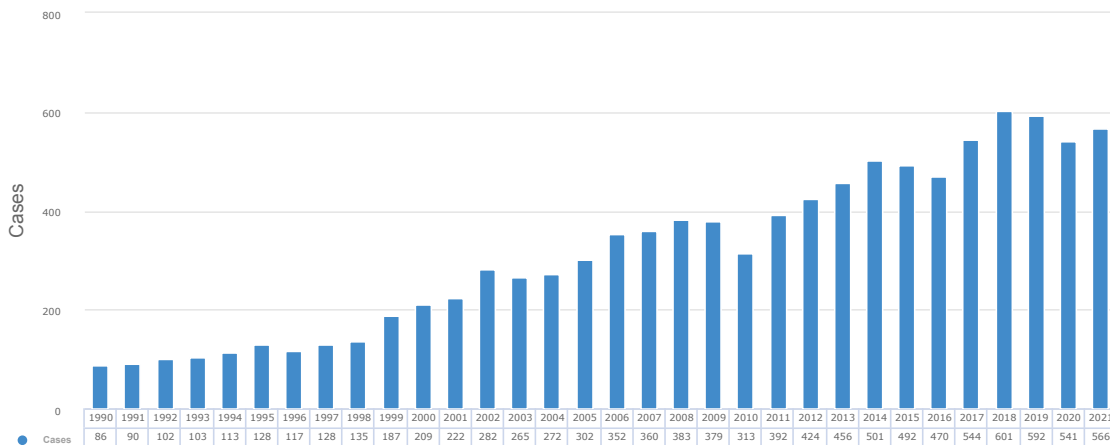
Pediatric Cardiac Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	255	4.6%	115	45%
Mechanical: Other tubing rupture	8	0.1%	2	25%
Mechanical: Pump Failure	46	0.8%	29	63%
Mechanical: Temperature Regulation Device Malfunction	9	0.2%	7	78%
Mechanical: Clots: hemofilter	142	2.6%	70	49%
Mechanical: Air in circuit	157	2.9%	87	55%
Mechanical: Cracks in pigtail connectors	13	0.2%	5	38%
Mechanical: Cannula problems	421	7.7%	236	56%
Mechanical: Circuit change	584	10.6%	286	49%
Mechanical: Clots and Air Emboli	22	0.4%	10	45%
Mechanical: Thrombosis/Clots: circuit component	841	15.3%	440	52%
Hemorrhagic: GI hemorrhage	140	2.6%	54	39%
Hemorrhagic: Cannulation site bleeding	173	3.2%	93	54%
Hemorrhagic: Surgical site bleeding	892	16.3%	457	51%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	304	5.5%	115	38%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	24	0.4%	4	17%
Hemorrhagic: Peripheral cannulation site bleeding	211	3.8%	140	66%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Mediastinal cannulation site bleeding	627	11.4%	311	50%
Neurologic: Brain death	101	1.8%	0	0%
Neurologic: Seizures: clinically determined	106	1.9%	46	43%
Neurologic: Seizures Confirmed by EEG	184	3.4%	76	41%
Neurologic: CNS Infarction (US or CT or MRI)	266	4.8%	103	39%
Neurologic: CNS hemorrhage by US/CT	125	2.3%	29	23%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	62	1.1%	20	32%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	143	2.6%	53	37%
Neurologic: CNS diffuse ischemia (CT/MRI)	116	2.1%	26	22%
Neurologic: Neurosurgical intervention performed	21	0.4%	6	29%
Renal: Creatinine 1.5 - 3.0	308	5.6%	140	45%
Renal: Creatinine > 3.0	100	1.8%	40	40%
Renal: Renal Replacement Therapy Required	1,521	27.7%	671	44%
Cardiovascular: Inotropes on ECLS	282	5.1%	144	51%
Cardiovascular: CPR required	107	2%	29	27%
Cardiovascular: Myocardial stun by echo	24	0.4%	8	33%
Cardiovascular: Cardiac arrhythmia	498	9.1%	275	55%
Cardiovascular: Hypertension requiring vasodilators	112	2%	69	62%
Cardiovascular: PDA: R->L	1	0%	0	0%
Cardiovascular: PDA: L->R	1	0%	1	100%
Cardiovascular: Tamponade (blood)	173	3.2%	87	50%
Cardiovascular: Tamponade (not blood)	23	0.4%	14	61%
Pulmonary: Pneumothorax requiring treatment	96	1.7%	40	42%
Pulmonary: Pulmonary hemorrhage	165	3%	65	39%
Infectious: Culture proven infection (see Infections)	55	1%	20	36%
Infectious: WBC < 1,500	60	1.1%	27	45%
Metabolic: Glucose < 40	13	0.2%	5	38%
Metabolic: Glucose > 240	87	1.6%	50	57%
Metabolic: pH < 7.20	63	1.1%	21	33%
Metabolic: pH > 7.60	20	0.4%	11	55%
Metabolic: Hyperbilirubinemia	317	5.8%	82	26%
Metabolic: Moderate hemolysis	370	6.7%	180	49%
Metabolic: Severe hemolysis	289	5.3%	70	24%
Limb: Ischemia	100	1.8%	38	38%
Limb: Compartment Syndrome	28	0.5%	15	54%
Limb: Fasciotomy	61	1.1%	28	46%
Limb: Amputation	24	0.4%	13	54%

Neonatal Cardiac (0-28 days)

Annual Cardiac Neonatal Runs



Neonatal Cardiac Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
<=1986	27	27	145	453	19	70%
1987	16	43	96	217	8	50%
1988	30	73	127	336	16	53%
1989	53	126	129	344	30	56%
1990	86	212	124	348	39	45%
1991	90	302	144	600	36	40%
1992	102	404	167	696	42	41%
1993	103	507	173	831	40	38%
1994	113	620	179	667	39	34%
1995	128	748	155	701	43	33%
1996	117	865	136	767	42	35%
1997	128	993	157	1,126	42	32%
1998	135	1,128	150	765	50	37%
1999	187	1,315	152	1,258	64	34%
2000	209	1,524	134	645	65	31%
2001	222	1,746	147	1,198	80	36%
2002	282	2,028	138	907	100	35%
2003	265	2,293	162	954	102	38%
2004	272	2,565	147	989	112	41%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2005	302	2,867	156	1,871	103	34%
2006	352	3,219	141	726	126	35%
2007	360	3,579	153	952	147	40%
2008	383	3,962	149	721	155	40%
2009	379	4,341	159	1,524	160	42%
2010	313	4,654	149	1,099	147	46%
2011	392	5,046	159	3,141	172	43%
2012	424	5,470	149	1,196	198	46%
2013	456	5,926	155	1,400	206	45%
2014	501	6,427	150	1,481	226	45%
2015	492	6,919	157	4,053	220	44%
2016	470	7,389	160	1,676	223	47%
2017	544	7,933	149	1,082	296	54%
2018	601	8,534	154	3,566	313	52%
2019	592	9,126	165	2,109	293	49%
2020	541	9,667	155	1,614	278	51%
2021	566	10,233	163	1,848	314	55%

Neonatal Cardiac Runs by Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Congenital Defect	1,391	138	1,463	724	52%
Cardiac Arrest	16	142	417	6	37%
Cardiogenic Shock	180	158	1,746	81	45%
Cardiomyopathy	15	436	2,109	8	53%
Myocarditis	8	213	628	6	75%
Other	1,152	177	3,566	629	54%

Note some runs are missing primary diagnoses

Neonatal Cardiac Runs by Congenital Diagnosis from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Left to right shunt (ASD/VSD/PDA/AV canal/AVSD/ECD)	63	143	454	29	46%
Left-sided obstructive (aortic stenosis/mitral stenosis/coarctation)	76	132	430	43	56%
Hypoplastic left heart	381	134	1,130	173	45%
Right-sided obstructive (pulmonary stenosis/pulmonary or tricuspid atresia)	52	146	862	33	63%
Cyanotic incr. pulmonary flow (truncus arteriosus/TGA/TGV)	62	162	695	27	43%

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Cyanotic incr. pulm. congestion (TAP VR/P APVR)	183	120	1,046	92	50%
Cyanotic decr. pulmonary flow (TOF/DORV/Ebsteins)	363	159	1,463	196	53%
Other	211	119	940	131	62%

Note some runs are missing primary diagnoses

Initial Neonatal Cardiac Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	14	142	603	9	64%
VA	2,816	157	3,566	1,478	52%
VVA	12	269	881	5	41%
Other	2	99	104	2	100%

Runs with Conversions - Neonatal Cardiac Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	2	84	163	0	0%
VA to VV	16	816	3,566	5	31%
Other	13	443	868	5	38%

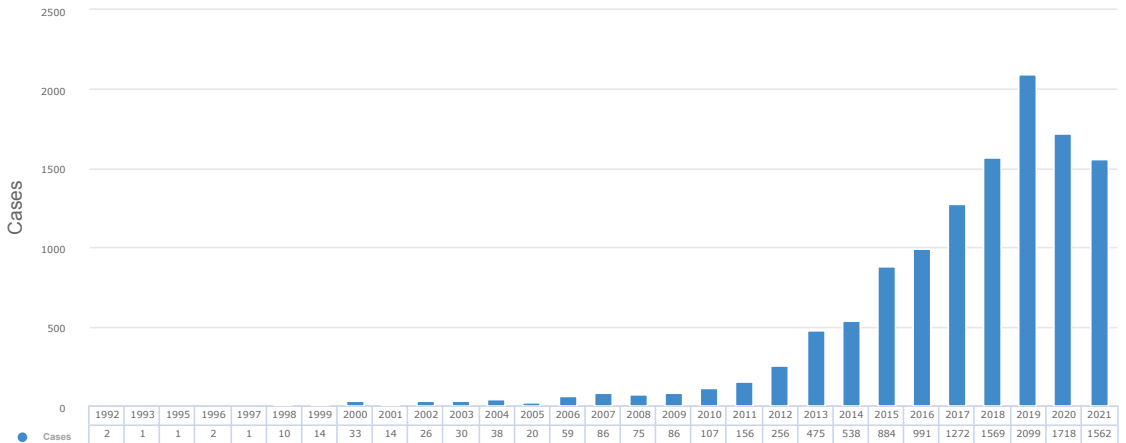
Neonatal Cardiac Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	146	5.1%	41	28%
Mechanical: Other tubing rupture	2	0.1%	1	50%
Mechanical: Pump Failure	24	0.8%	10	42%
Mechanical: Temperature Regulation Device Malfunction	5	0.2%	1	20%
Mechanical: Clots: hemofilter	115	4%	38	33%
Mechanical: Air in circuit	86	3%	25	29%
Mechanical: Cracks in pigtail connectors	7	0.2%	4	57%
Mechanical: Cannula problems	247	8.7%	84	34%
Mechanical: Circuit change	324	11.4%	82	25%
Mechanical: Clots and Air Emboli	10	0.4%	3	30%
Mechanical: Thrombosis/Clots: circuit component	471	16.6%	195	41%
Hemorrhagic: GI hemorrhage	34	1.2%	6	18%
Hemorrhagic: Cannulation site bleeding	72	2.5%	25	35%
Hemorrhagic: Surgical site bleeding	421	14.8%	136	32%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	214	7.5%	61	29%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	16	0.6%	1	6%
Hemorrhagic: Peripheral cannulation site bleeding	45	1.6%	20	44%
Hemorrhagic: Mediastinal cannulation site bleeding	355	12.5%	112	32%

	No Reported	% Reported	Survived	% Survived
Neurologic: Brain death	16	0.6%	0	0%
Neurologic: Seizures: clinically determined	68	2.4%	25	37%
Neurologic: Seizures Confirmed by EEG	178	6.3%	61	34%
Neurologic: CNS Infarction (US or CT or MRI)	90	3.2%	30	33%
Neurologic: CNS hemorrhage by US/CT	130	4.6%	31	24%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	94	3.3%	23	24%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	112	3.9%	31	28%
Neurologic: CNS diffuse ischemia (CT/MRI)	29	1%	7	24%
Neurologic: Neurosurgical intervention performed	6	0.2%	2	33%
Renal: Creatinine 1.5 - 3.0	94	3.3%	19	20%
Renal: Creatinine > 3.0	15	0.5%	6	40%
Renal: Renal Replacement Therapy Required	818	28.8%	267	33%
Cardiovascular: Inotropes on ECLS	158	5.6%	62	39%
Cardiovascular: CPR required	72	2.5%	14	19%
Cardiovascular: Myocardial stun by echo	10	0.4%	1	10%
Cardiovascular: Cardiac arrhythmia	246	8.6%	84	34%
Cardiovascular: Hypertension requiring vasodilators	37	1.3%	21	57%
Cardiovascular: PDA: R->L	1	0%	1	100%
Cardiovascular: PDA: L->R	5	0.2%	5	100%
Cardiovascular: PDA: bidirectional	5	0.2%	2	40%
Cardiovascular: PDA: unknown	1	0%	0	0%
Cardiovascular: Tamponade (blood)	80	2.8%	33	41%
Cardiovascular: Tamponade (not blood)	15	0.5%	4	27%
Pulmonary: Pneumothorax requiring treatment	54	1.9%	19	35%
Pulmonary: Pulmonary hemorrhage	57	2%	12	21%
Infectious: Culture proven infection (see Infections)	16	0.6%	2	13%
Infectious: WBC < 1,500	21	0.7%	8	38%
Metabolic: Glucose < 40	10	0.4%	3	30%
Metabolic: Glucose > 240	42	1.5%	17	40%
Metabolic: pH < 7.20	45	1.6%	11	24%
Metabolic: pH > 7.60	22	0.8%	10	45%
Metabolic: Hyperbilirubinemia	185	6.5%	59	32%
Metabolic: Moderate hemolysis	192	6.8%	64	33%
Metabolic: Severe hemolysis	144	5.1%	39	27%
Limb: Ischemia	24	0.8%	7	29%
Limb: Compartment Syndrome	2	0.1%	0	0%
Limb: Amputation	1	0%	1	100%

Adult ECPR (18 years and over)

Annual ECPR Adult Runs



Adult ECPR Runs by Year

Year	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
1992	2	2	11	22	1	50%
1993	1	3	2	2	0	0%
1995	1	4	1	1	0	0%
1996	2	6	69	71	1	50%
1997	1	7	70	70	0	0%
1998	10	17	61	167	4	40%
1999	14	31	79	215	1	7%
2000	33	64	71	335	11	33%
2001	14	78	113	273	8	57%
2002	26	104	62	197	7	26%
2003	30	134	91	302	16	53%
2004	38	172	118	842	7	18%
2005	20	192	95	261	8	40%
2006	59	251	83	1,421	8	13%
2007	86	337	108	627	21	24%
2008	75	412	76	459	22	29%
2009	86	498	78	833	26	30%
2010	107	605	102	893	35	32%
2011	156	761	106	2,209	40	25%
2012	256	1,017	104	718	64	25%
2013	475	1,492	106	1,368	147	30%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2014	538	2,030	115	1,662	173	32%
2015	884	2,914	111	1,513	261	29%
2016	991	3,905	109	1,865	261	26%
2017	1,272	5,177	99	2,874	372	29%
2018	1,569	6,746	102	2,892	487	31%
2019	2,099	8,845	105	3,208	667	31%
2020	1,718	10,563	108	1,947	522	30%
2021	1,562	12,125	138	7,217	514	32%

Initial Adult ECPR Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	122	182	7,217	30	24%
VA	7,959	108	6,696	2,491	31%
VVA	117	177	3,503	35	29%
Other	19	320	3,095	6	31%
Unknown	3	27	75	0	0%

Runs with Conversions - Adult ECPR Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	11	110	365	3	27%
VA to VV	129	304	2,069	53	41%
Other	225	397	7,217	72	32%

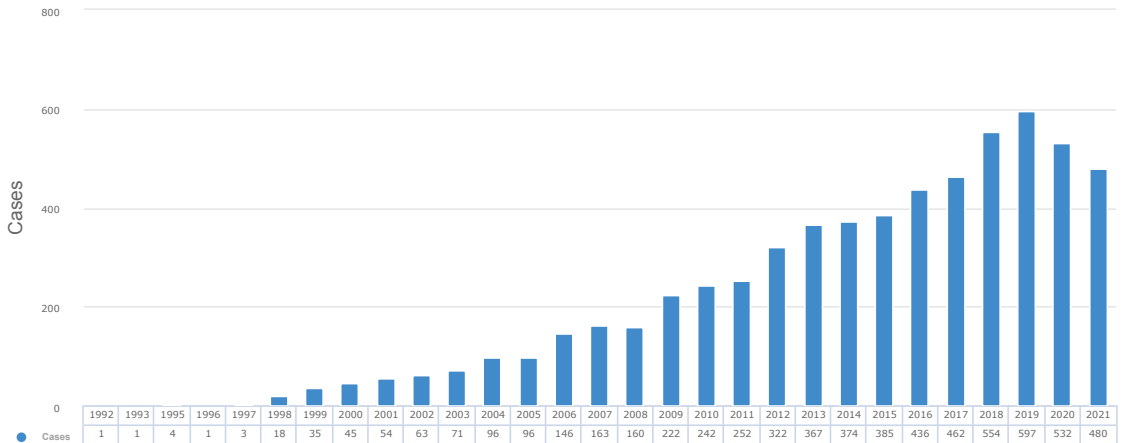
Adult ECPR Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	202	2.5%	62	31%
Mechanical: Other tubing rupture	7	0.1%	1	14%
Mechanical: Pump Failure	35	0.4%	14	40%
Mechanical: Clots: hemofilter	22	0.3%	6	27%
Mechanical: Air in circuit	72	0.9%	15	21%
Mechanical: Cracks in pigtail connectors	1	0%	0	0%
Mechanical: Cannula problems	337	4.1%	76	23%
Mechanical: Circuit change	174	2.1%	52	30%
Mechanical: Clots and Air Emboli	15	0.2%	3	20%
Mechanical: Thrombosis/Clots: circuit component	294	3.6%	107	36%
Hemorrhagic: GI hemorrhage	352	4.3%	66	19%
Hemorrhagic: Cannulation site bleeding	258	3.1%	86	33%
Hemorrhagic: Surgical site bleeding	558	6.8%	152	27%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	94	1.1%	26	28%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Disseminated intravascular coagulation (DIC)	19	0.2%	5	26%
Hemorrhagic: Peripheral cannulation site bleeding	632	7.7%	198	31%
Hemorrhagic: Mediastinal cannulation site bleeding	135	1.6%	25	19%
Neurologic: Brain death	413	5%	0	0%
Neurologic: Seizures: clinically determined	118	1.4%	27	23%
Neurologic: Seizures Confirmed by EEG	112	1.4%	20	18%
Neurologic: CNS Infarction (US or CT or MRI)	329	4%	74	22%
Neurologic: CNS hemorrhage by US/CT	82	1%	10	12%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	45	0.5%	7	16%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	104	1.3%	20	19%
Neurologic: CNS diffuse ischemia (CT/MRI)	386	4.7%	25	6%
Neurologic: Neurosurgical intervention performed	14	0.2%	6	43%
Renal: Creatinine 1.5 - 3.0	1,065	13%	298	28%
Renal: Creatinine > 3.0	516	6.3%	147	28%
Renal: Renal Replacement Therapy Required	1,797	21.9%	459	26%
Cardiovascular: Inotropes on ECLS	313	3.8%	82	26%
Cardiovascular: CPR required	333	4.1%	44	13%
Cardiovascular: Myocardial stun by echo	38	0.5%	9	24%
Cardiovascular: Cardiac arrhythmia	1,330	16.2%	356	27%
Cardiovascular: Hypertension requiring vasodilators	27	0.3%	12	44%
Cardiovascular: Tamponade (blood)	164	2%	41	25%
Cardiovascular: Tamponade (not blood)	18	0.2%	5	28%
Pulmonary: Pneumothorax requiring treatment	174	2.1%	50	29%
Pulmonary: Pulmonary hemorrhage	154	1.9%	40	26%
Infectious: Culture proven infection (see Infections)	71	0.9%	30	42%
Infectious: WBC < 1,500	50	0.6%	6	12%
Metabolic: Glucose < 40	12	0.1%	0	0%
Metabolic: Glucose > 240	159	1.9%	53	33%
Metabolic: pH < 7.20	148	1.8%	37	25%
Metabolic: pH > 7.60	18	0.2%	9	50%
Metabolic: Hyperbilirubinemia	267	3.2%	45	17%
Metabolic: Moderate hemolysis	111	1.4%	34	31%
Metabolic: Severe hemolysis	78	0.9%	19	24%
Limb: Ischemia	390	4.7%	100	26%
Limb: Compartment Syndrome	65	0.8%	18	28%
Limb: Fasciotomy	208	2.5%	58	28%
Limb: Amputation	52	0.6%	19	37%

Pediatric ECPR (>28 days and <18 years)

Annual ECPR Pediatric Runs



Pediatric ECPR Runs by Year

Year	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
1992	1	1	180	180	0	0%
1993	1	2	137	137	0	0%
1995	4	6	130	320	1	25%
1996	1	7	24	24	0	0%
1997	3	10	23	43	0	0%
1998	18	28	90	500	4	22%
1999	35	63	87	380	17	48%
2000	45	108	108	720	19	42%
2001	54	162	109	457	15	27%
2002	63	225	149	916	29	46%
2003	71	296	97	535	32	45%
2004	96	392	125	832	39	40%
2005	96	488	120	751	33	34%
2006	146	634	106	719	57	39%
2007	163	797	120	736	68	41%
2008	160	957	108	751	61	38%
2009	222	1,179	121	1,410	86	38%
2010	242	1,421	130	2,900	104	42%
2011	252	1,673	112	944	119	47%
2012	322	1,995	144	4,755	143	44%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2013	367	2,362	136	2,320	155	42%
2014	374	2,736	131	1,537	171	45%
2015	385	3,121	127	1,422	153	39%
2016	436	3,557	123	1,511	182	41%
2017	462	4,019	129	4,281	228	49%
2018	554	4,573	133	3,010	238	42%
2019	597	5,170	126	1,273	244	40%
2020	532	5,702	116	1,210	229	43%
2021	480	6,182	107	1,189	192	40%

Initial Pediatric ECPR Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	24	133	762	10	41%
VA	2,550	122	4,281	1,104	43%
VVA	40	109	594	13	32%
Other	11	138	352	4	36%

Runs with Conversions - Pediatric ECPR Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	5	125	337	0	0%
VA to VV	17	558	1,227	8	47%
Other	45	333	2,063	19	42%

Pediatric ECPR Complications from 2017 to 2021

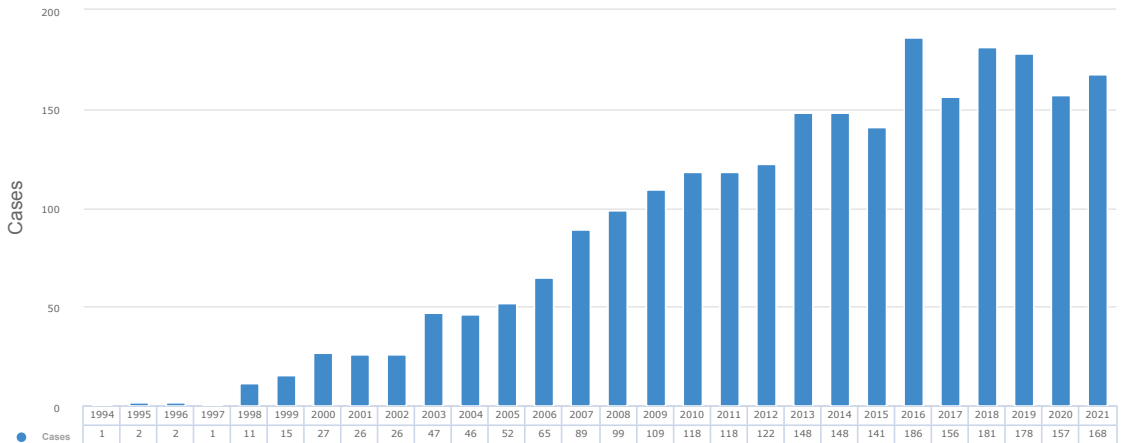
	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	103	3.9%	41	40%
Mechanical: Raceway rupture	2	0.1%	2	100%
Mechanical: Other tubing rupture	3	0.1%	1	33%
Mechanical: Pump Failure	12	0.5%	4	33%
Mechanical: Temperature Regulation Device Malfunction	5	0.2%	4	80%
Mechanical: Clots: hemofilter	68	2.6%	20	29%
Mechanical: Air in circuit	66	2.5%	21	32%
Mechanical: Cracks in pigtail connectors	4	0.2%	2	50%
Mechanical: Cannula problems	224	8.5%	78	35%
Mechanical: Circuit change	178	6.8%	68	38%
Mechanical: Clots and Air Emboli	3	0.1%	1	33%
Mechanical: Thrombosis/Clots: circuit component	265	10.1%	126	48%
Hemorrhagic: GI hemorrhage	92	3.5%	16	17%
Hemorrhagic: Cannulation site bleeding	69	2.6%	25	36%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Surgical site bleeding	225	8.6%	61	27%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	125	4.8%	46	37%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	20	0.8%	2	10%
Hemorrhagic: Peripheral cannulation site bleeding	106	4%	38	36%
Hemorrhagic: Mediastinal cannulation site bleeding	188	7.2%	75	40%
Neurologic: Brain death	160	6.1%	0	0%
Neurologic: Seizures: clinically determined	144	5.5%	46	32%
Neurologic: Seizures Confirmed by EEG	266	10.1%	105	39%
Neurologic: CNS Infarction (US or CT or MRI)	211	8%	68	32%
Neurologic: CNS hemorrhage by US/CT	95	3.6%	39	41%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	28	1.1%	7	25%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	84	3.2%	29	35%
Neurologic: CNS diffuse ischemia (CT/MRI)	187	7.1%	25	13%
Neurologic: Neurosurgical intervention performed	10	0.4%	3	30%
Renal: Creatinine 1.5 - 3.0	198	7.5%	66	33%
Renal: Creatinine > 3.0	68	2.6%	24	35%
Renal: Renal Replacement Therapy Required	666	25.4%	232	35%
Cardiovascular: Inotropes on ECLS	109	4.2%	41	38%
Cardiovascular: CPR required	86	3.3%	19	22%
Cardiovascular: Myocardial stun by echo	9	0.3%	2	22%
Cardiovascular: Cardiac arrhythmia	233	8.9%	99	42%
Cardiovascular: Hypertension requiring vasodilators	51	1.9%	29	57%
Cardiovascular: PDA: L->R	1	0%	1	100%
Cardiovascular: Tamponade (blood)	42	1.6%	22	52%
Cardiovascular: Tamponade (not blood)	10	0.4%	3	30%
Pulmonary: Pneumothorax requiring treatment	49	1.9%	18	37%
Pulmonary: Pulmonary hemorrhage	111	4.2%	23	21%
Infectious: Culture proven infection (see Infections)	21	0.8%	7	33%
Infectious: WBC < 1,500	10	0.4%	4	40%
Metabolic: Glucose < 40	5	0.2%	1	20%
Metabolic: Glucose > 240	46	1.8%	17	37%
Metabolic: pH < 7.20	40	1.5%	10	25%
Metabolic: pH > 7.60	7	0.3%	4	57%
Metabolic: Hyperbilirubinemia	86	3.3%	21	24%
Metabolic: Moderate hemolysis	118	4.5%	46	39%
Metabolic: Severe hemolysis	82	3.1%	22	27%
Limb: Ischemia	42	1.6%	14	33%
Limb: Compartment Syndrome	16	0.6%	7	44%
Limb: Fasciotomy	31	1.2%	14	45%

	No Reported	% Reported	Survived	% Survived
Limb: Amputation	5	0.2%	1	20%

Neonatal ECPR (0-28 days)

Annual ECPR Neonatal Runs



Neonatal ECPR Runs by Year

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
1994	1	1	61	61	1	100%
1995	2	3	126	133	1	50%
1996	2	5	136	152	2	100%
1997	1	6	159	159	1	100%
1998	11	17	96	337	5	45%
1999	15	32	82	297	4	26%
2000	27	59	166	857	10	37%
2001	26	85	127	403	9	34%
2002	26	111	111	246	10	38%
2003	47	158	159	902	20	42%
2004	46	204	119	653	19	41%
2005	52	256	152	1,079	16	30%
2006	65	321	124	474	27	41%
2007	89	410	113	700	34	38%
2008	99	509	161	1,082	35	35%
2009	109	618	119	701	47	43%
2010	118	736	128	856	55	46%
2011	118	854	132	924	43	36%
2012	122	976	114	1,041	51	41%
2013	148	1,124	157	3,096	72	48%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2014	148	1,272	144	3,839	64	43%
2015	141	1,413	136	1,010	63	44%
2016	186	1,599	150	747	75	40%
2017	156	1,755	177	1,488	54	34%
2018	181	1,936	125	2,380	95	52%
2019	178	2,114	132	752	88	49%
2020	157	2,271	138	634	65	41%
2021	168	2,439	133	577	76	45%

Initial Neonatal ECPR Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	2	184	365	0	0%
VA	838	140	2,380	378	45%

Runs with Conversions - Neonatal ECPR Support Mode Details from 2017 to 2021

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VA to VV	3	396	640	2	66%
Other	6	400	1,077	2	33%

Neonatal ECPR Complications from 2017 to 2021

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	39	4.6%	9	23%
Mechanical: Pump Failure	9	1.1%	3	33%
Mechanical: Temperature Regulation Device Malfunction	2	0.2%	0	0%
Mechanical: Clots: hemofilter	23	2.7%	6	26%
Mechanical: Air in circuit	28	3.3%	7	25%
Mechanical: Cracks in pigtail connectors	1	0.1%	0	0%
Mechanical: Cannula problems	84	10%	24	29%
Mechanical: Circuit change	86	10.2%	20	23%
Mechanical: Clots and Air Emboli	2	0.2%	2	100%
Mechanical: Thrombosis/Clots: circuit component	130	15.5%	42	32%
Hemorrhagic: GI hemorrhage	14	1.7%	2	14%
Hemorrhagic: Cannulation site bleeding	12	1.4%	1	8%
Hemorrhagic: Surgical site bleeding	95	11.3%	27	28%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	57	6.8%	20	35%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	13	1.5%	2	15%
Hemorrhagic: Peripheral cannulation site bleeding	14	1.7%	6	43%
Hemorrhagic: Mediastinal cannulation site bleeding	150	17.9%	58	39%
Neurologic: Brain death	7	0.8%	0	0%

	No Reported	% Reported	Survived	% Survived
Neurologic: Seizures: clinically determined	35	4.2%	14	40%
Neurologic: Seizures Confirmed by EEG	114	13.6%	42	37%
Neurologic: CNS Infarction (US or CT or MRI)	35	4.2%	12	34%
Neurologic: CNS hemorrhage by US/CT	48	5.7%	8	17%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	36	4.3%	7	19%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	41	4.9%	10	24%
Neurologic: CNS diffuse ischemia (CT/MRI)	31	3.7%	7	23%
Renal: Creatinine 1.5 - 3.0	32	3.8%	6	19%
Renal: Creatinine > 3.0	4	0.5%	2	50%
Renal: Renal Replacement Therapy Required	246	29.3%	64	26%
Cardiovascular: Inotropes on ECLS	49	5.8%	14	29%
Cardiovascular: CPR required	29	3.5%	4	14%
Cardiovascular: Myocardial stun by echo	3	0.4%	0	0%
Cardiovascular: Cardiac arrhythmia	67	8%	25	37%
Cardiovascular: Hypertension requiring vasodilators	21	2.5%	8	38%
Cardiovascular: PDA: R->L	1	0.1%	0	0%
Cardiovascular: PDA: L->R	1	0.1%	0	0%
Cardiovascular: Tamponade (blood)	24	2.9%	11	46%
Cardiovascular: Tamponade (not blood)	3	0.4%	1	33%
Pulmonary: Pneumothorax requiring treatment	16	1.9%	4	25%
Pulmonary: Pulmonary hemorrhage	16	1.9%	5	31%
Infectious: Culture proven infection (see Infections)	7	0.8%	0	0%
Infectious: WBC < 1,500	7	0.8%	2	29%
Metabolic: Glucose < 40	4	0.5%	2	50%
Metabolic: Glucose > 240	15	1.8%	6	40%
Metabolic: pH < 7.20	20	2.4%	7	35%
Metabolic: pH > 7.60	6	0.7%	0	0%
Metabolic: Hyperbilirubinemia	60	7.1%	17	28%
Metabolic: Moderate hemolysis	61	7.3%	25	41%
Metabolic: Severe hemolysis	71	8.5%	17	24%
Limb: Ischemia	3	0.4%	1	33%
Limb: Compartment Syndrome	2	0.2%	1	50%