

ECLS Registry Report

International Summary

October, 2021

Report data through 2020



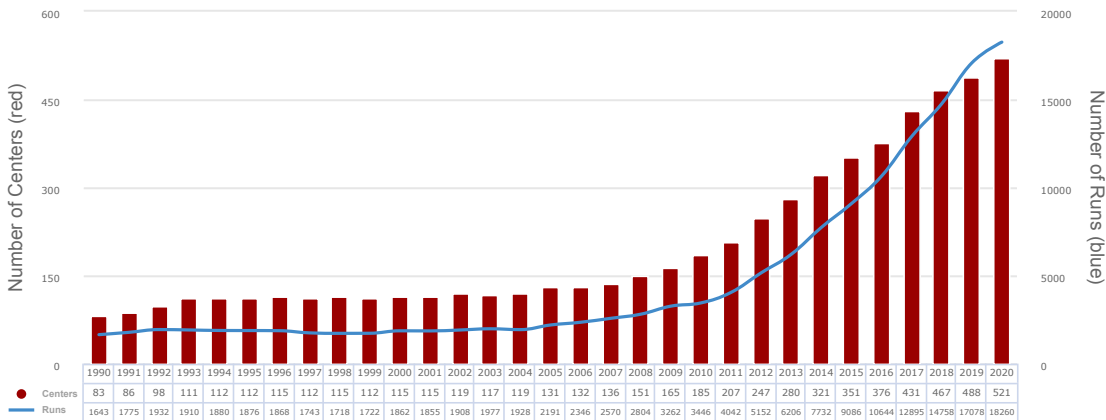
Extracorporeal Life Support Organization
3001 Miller Rd
Ann Arbor, MI 48103 USA

Overall Outcomes

	Total Runs	Survived ECLS		Survived to DC or Transfer	
Neonatal					
Pulmonary	33,484	29,332	87%	24,457	73%
Cardiac	9,620	6,648	69%	4,218	43%
ECPR	2,261	1,588	70%	961	42%
Pediatric					
Pulmonary	11,223	8,122	72%	6,775	60%
Cardiac	14,078	10,204	72%	7,594	53%
ECPR	5,682	3,379	59%	2,417	42%
Adult					
Pulmonary	34,319	23,254	67%	20,320	59%
Cardiac	33,115	19,727	59%	14,765	44%
ECPR	10,324	4,315	41%	3,113	30%
Total	154,106	106,569	69%	84,620	54%

Centers

Centers by year

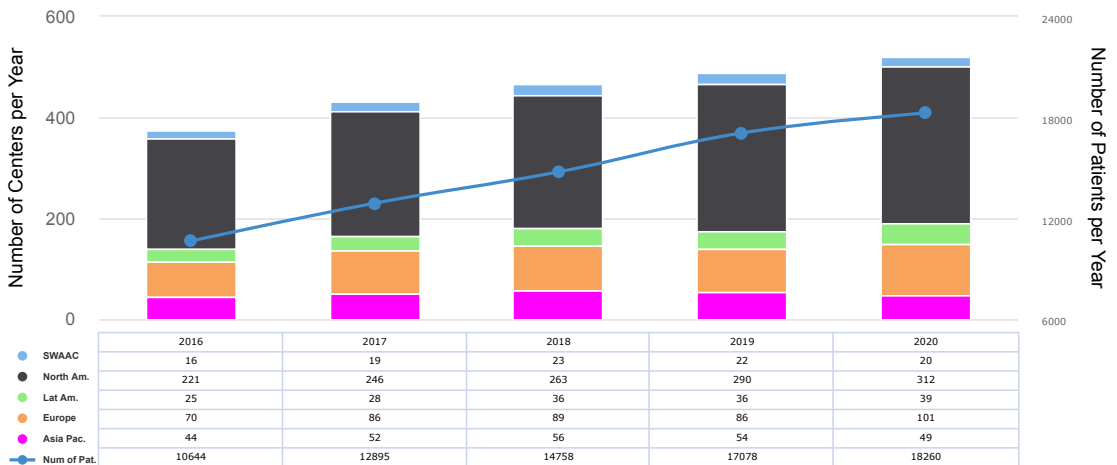


Overall Outcomes from 2016 to 2020

	Total Runs	Survived ECLS	Survived to DC or Transfer		
Neonatal					
Pulmonary	4,036	3,316	82%	2,812	69%
Cardiac	2,703	1,930	71%	1,389	51%
ECPR	850	570	67%	374	44%
Pediatric					
Pulmonary	3,571	2,691	75%	2,386	66%
Cardiac	5,158	3,876	75%	3,074	59%
ECPR	2,561	1,472	57%	1,111	43%
Adult					
Pulmonary	23,748	15,983	67%	14,296	60%
Cardiac	23,597	13,944	59%	10,840	45%
ECPR	7,411	3,037	40%	2,252	30%
Total	73,635	46,819	63%	38,534	52%

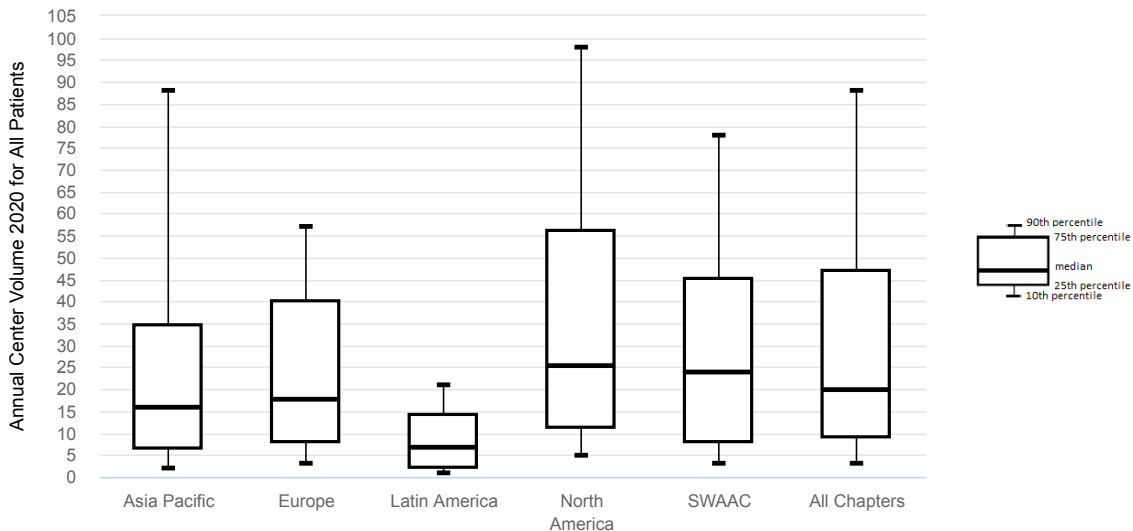
Centers by region

ELSO Centers and Patient Counts

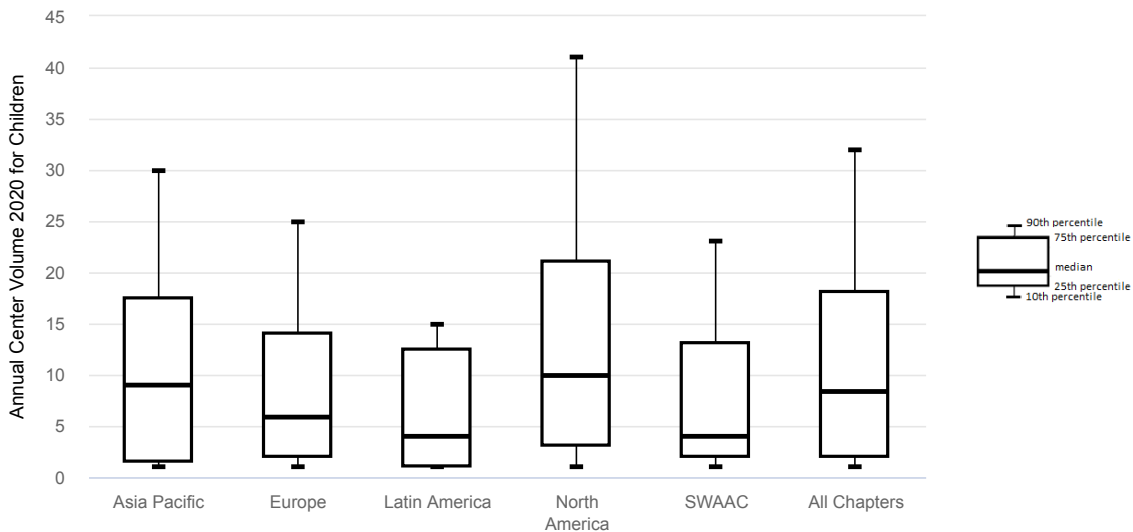


Annual Center Volume in 2020

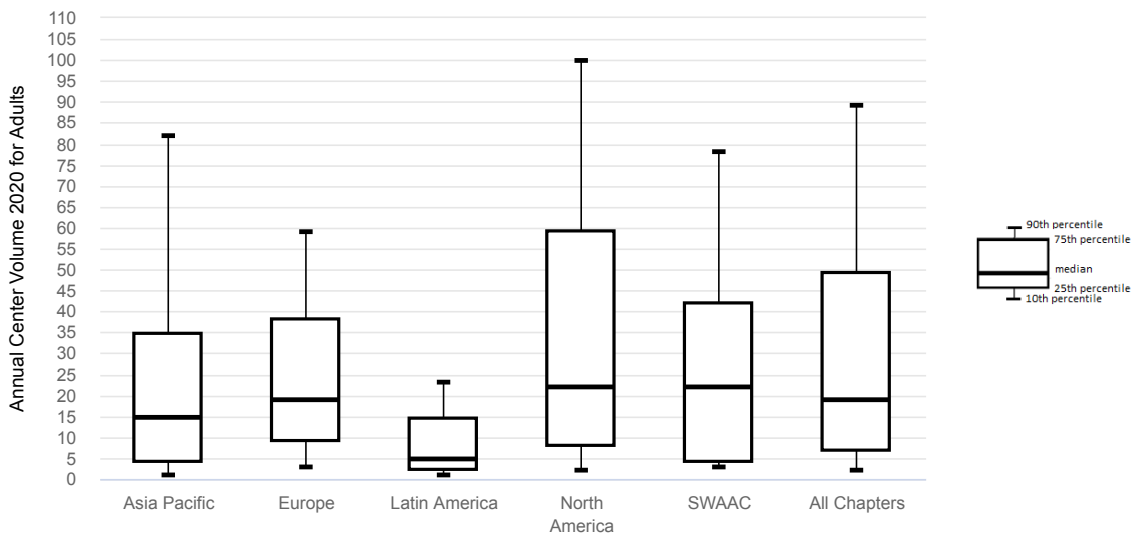
All Patients



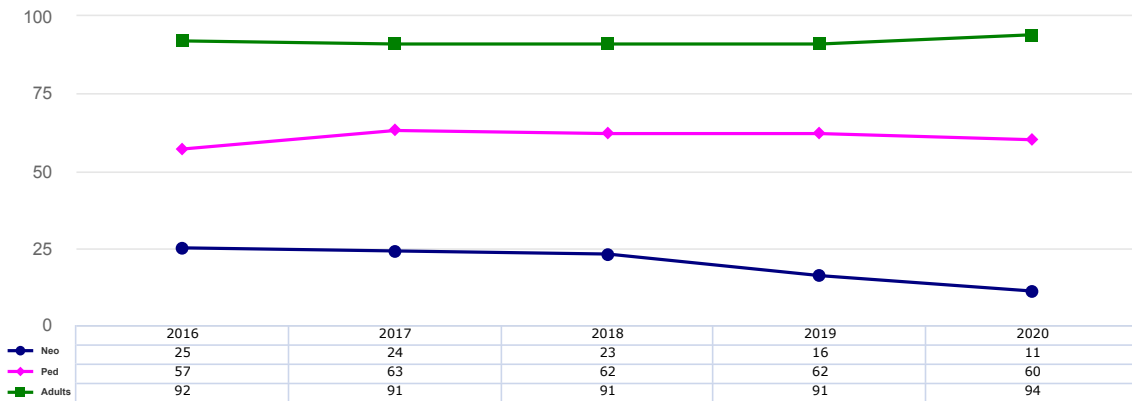
Children (Neonatal and Pediatric)



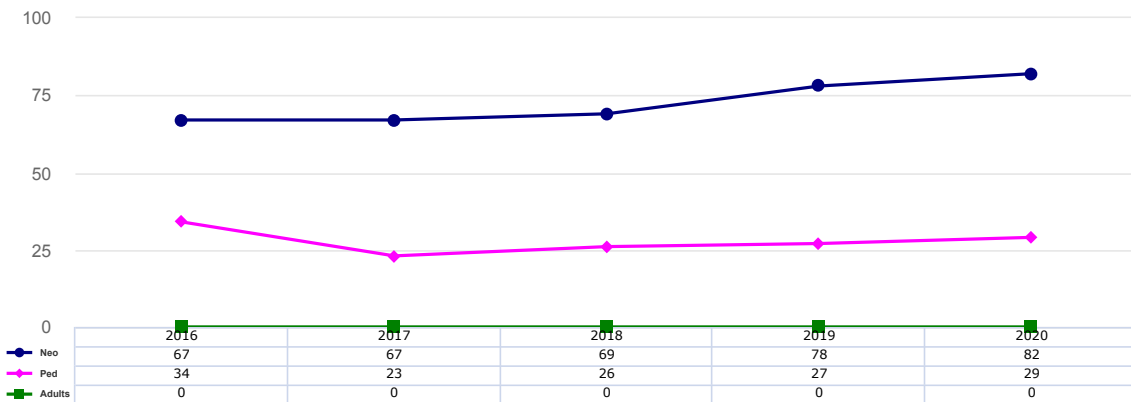
Adults



Proportion of VV Cannulation (Respiratory only)

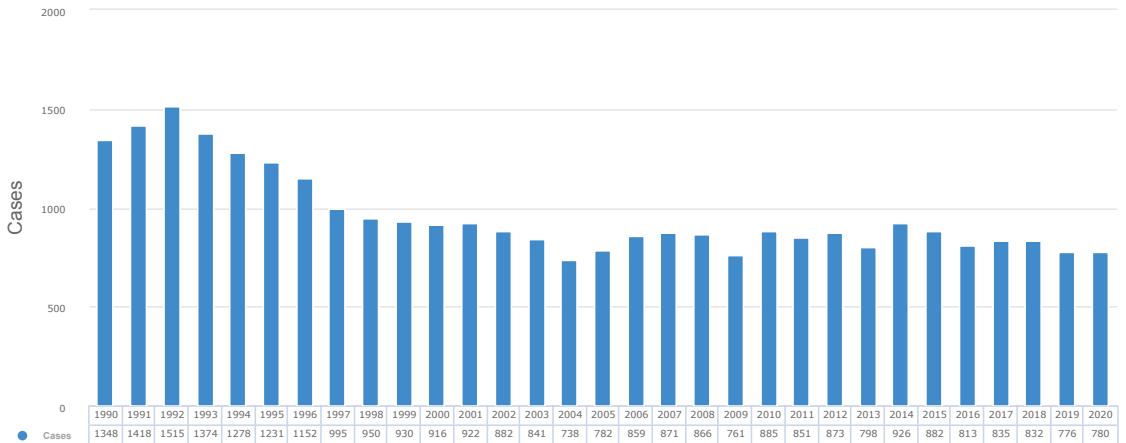


Proportion of respiratory ECMO support with carotid artery cannulation



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	819	819	118	840	658	80%
1987	651	1,470	121	411	558	85%
1988	1,015	2,485	131	601	841	82%
1989	1,119	3,604	134	500	917	81%
1990	1,348	4,952	144	672	1,095	81%
1991	1,418	6,370	153	827	1,141	80%
1992	1,515	7,885	155	2,832	1,180	77%
1993	1,374	9,259	158	959	1,093	79%
1994	1,278	10,537	161	936	972	76%
1995	1,231	11,768	163	794	930	75%
1996	1,152	12,920	167	1,176	841	73%
1997	995	13,915	173	1,131	742	74%
1998	950	14,865	187	1,093	681	71%
1999	930	15,795	183	812	672	72%
2000	916	16,711	188	936	692	75%
2001	922	17,633	190	949	655	71%
2002	882	18,515	189	944	624	70%
2003	841	19,356	195	1,001	554	65%
2004	738	20,094	196	956	481	65%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2005	782	20,876	204	1,006	531	67%
2006	859	21,735	207	1,033	576	67%
2007	871	22,606	198	1,229	583	66%
2008	866	23,472	212	1,133	580	66%
2009	761	24,233	211	1,327	522	68%
2010	885	25,118	204	2,549	612	69%
2011	851	25,969	223	2,745	562	66%
2012	873	26,842	227	3,435	611	69%
2013	798	27,640	213	1,908	534	66%
2014	926	28,566	221	2,305	644	69%
2015	882	29,448	214	1,662	563	63%
2016	813	30,261	227	1,733	533	65%
2017	835	31,096	211	2,286	592	70%
2018	832	31,928	228	2,693	602	72%
2019	776	32,704	217	2,197	544	70%
2020	780	33,484	231	2,235	541	69%

Neonatal Respiratory Runs by Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
CDH	1,301	325	2,235	730	56%
MAS	611	151	2,286	559	91%
PPHN/PFC	393	167	1,154	288	73%
RDS	26	179	522	21	80%
Sepsis	97	157	686	51	52%
Pneumonia	17	387	982	7	41%
Air Leak Syndrome	3	199	282	2	66%
Other	1,543	184	2,693	1,120	72%

Note some runs are missing primary diagnoses

Initial Neonatal Respiratory Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	828	176	1,290	642	77%
VA	3,181	236	2,693	2,150	67%
VVA	20	207	937	15	75%
Other	6	165	341	5	83%
Unknow	1			0	0%

Runs with Conversions - Neonatal Respiratory Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	61	240	837	29	47%
VA to VV	11	904	2,693	6	54%
Other	15	329	1,012	5	33%

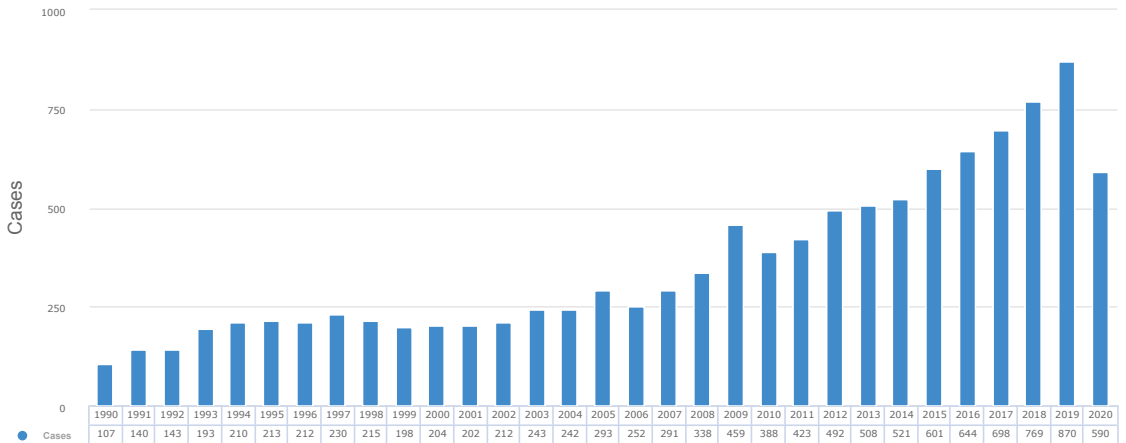
Neonatal Respiratory Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	217	5.4%	111	51%
Mechanical: Raceway rupture	2	0%	2	100%
Mechanical: Other tubing rupture	5	0.1%	4	80%
Mechanical: Pump Failure	25	0.6%	12	48%
Mechanical: Temperature Regulation Device Malfunction	14	0.3%	6	43%
Mechanical: Clots: hemofilter	227	5.6%	97	43%
Mechanical: Air in circuit	123	3%	55	45%
Mechanical: Cracks in pigtail connectors	13	0.3%	6	46%
Mechanical: Cannula problems	585	14.5%	341	58%
Mechanical: Circuit change	647	16%	294	45%
Mechanical: Clots and Air Emboli	49	1.2%	37	76%
Mechanical: Thrombosis/Clots: circuit component	1,358	33.6%	717	53%
Hemorrhagic: GI hemorrhage	59	1.5%	21	36%
Hemorrhagic: Cannulation site bleeding	255	6.3%	162	64%
Hemorrhagic: Surgical site bleeding	269	6.7%	104	39%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	532	13.2%	274	52%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	75	1.9%	38	51%
Hemorrhagic: Peripheral cannulation site bleeding	133	3.3%	92	69%
Hemorrhagic: Mediastinal cannulation site bleeding	16	0.4%	6	38%
Neurologic: Brain death	5	0.1%	0	0%
Neurologic: Seizures: clinically determined	97	2.4%	49	51%
Neurologic: Seizures Confirmed by EEG	200	5%	94	47%
Neurologic: CNS Infarction (US or CT or MRI)	109	2.7%	40	37%
Neurologic: CNS hemorrhage by US/CT	293	7.3%	120	41%

	No Reported	% Reported	Survived	% Survived
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	77	1.9%	28	36%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	84	2.1%	31	37%
Neurologic: CNS diffuse ischemia (CT/MRI)	10	0.2%	1	10%
Renal: Creatinine 1.5 - 3.0	137	3.4%	52	38%
Renal: Creatinine > 3.0	14	0.3%	4	29%
Renal: Renal Replacement Therapy Required	1,004	24.9%	485	48%
Cardiovascular: Inotropes on ECLS	568	14.1%	331	58%
Cardiovascular: CPR required	95	2.4%	30	32%
Cardiovascular: Myocardial stun by echo	13	0.3%	5	38%
Cardiovascular: Cardiac arrhythmia	174	4.3%	93	53%
Cardiovascular: Hypertension requiring vasodilators	154	3.8%	92	60%
Cardiovascular: PDA: R->L	55	1.4%	23	42%
Cardiovascular: PDA: L->R	39	1%	23	59%
Cardiovascular: PDA: bidirectional	62	1.5%	31	50%
Cardiovascular: PDA: unknown	3	0.1%	2	67%
Cardiovascular: Tamponade (blood)	55	1.4%	25	45%
Cardiovascular: Tamponade (not blood)	16	0.4%	6	38%
Pulmonary: Pneumothorax requiring treatment	153	3.8%	75	49%
Pulmonary: Pulmonary hemorrhage	162	4%	62	38%
Infectious: Culture proven infection (see Infections)	82	2%	30	37%
Infectious: WBC < 1,500	19	0.5%	8	42%
Metabolic: Glucose < 40	55	1.4%	36	65%
Metabolic: Glucose > 240	149	3.7%	105	70%
Metabolic: pH < 7.20	144	3.6%	72	50%
Metabolic: pH > 7.60	63	1.6%	41	65%
Metabolic: Hyperbilirubinemia	393	9.7%	187	48%
Metabolic: Moderate hemolysis	351	8.7%	188	54%
Metabolic: Severe hemolysis	203	5%	101	50%
Limb: Ischemia	16	0.4%	2	13%

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	252	3,631	273	1,326	131	51%
2007	291	3,922	258	1,309	164	56%
2008	338	4,260	256	1,987	178	52%
2009	459	4,719	288	2,968	258	56%
2010	388	5,107	269	2,140	230	59%
2011	423	5,530	276	2,465	252	59%
2012	492	6,022	254	2,781	306	62%
2013	508	6,530	305	6,862	315	62%
2014	521	7,051	259	1,932	321	61%
2015	601	7,652	308	7,503	363	60%
2016	644	8,296	303	4,286	384	59%
2017	698	8,994	313	4,557	470	67%
2018	769	9,763	316	6,011	520	67%
2019	870	10,633	290	2,670	630	72%
2020	590	11,223	317	4,564	382	64%

Pediatric Respiratory Runs by Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Viral pneumonia	215	307	1,385	154	71%
Bacterial pneumonia	169	367	4,286	126	74%
Pneumocystis pneumonia	6	555	1,057	4	66%
Aspiration pneumonia	39	240	1,724	28	71%
ARDS, postop/trauma	20	248	711	14	70%
ARDS, not postop/trauma	391	377	4,379	270	69%
Acute resp failure, non-ARDS	227	305	2,717	152	66%
Other	2,413	294	6,011	1,586	65%

Note some runs are missing primary diagnoses

Initial Pediatric Respiratory Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	2,210	330	6,011	1,586	71%
VA	1,299	265	4,564	777	59%
VVA	42	343	1,333	16	38%
Other	17	390	1,058	5	29%
Unknow	3	624	624	2	66%

Runs with Conversions - Pediatric Respiratory Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	113	497	2,404	64	56%
VA to VV	46	676	4,564	28	60%
Other	81	668	6,011	42	51%

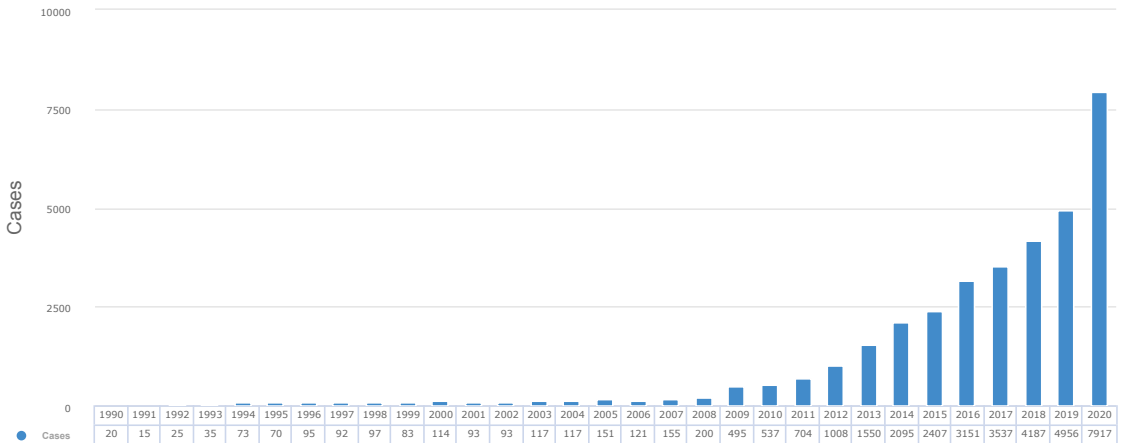
Pediatric Respiratory Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	239	6.7%	136	57%
Mechanical: Raceway rupture	6	0.2%	3	50%
Mechanical: Other tubing rupture	8	0.2%	2	25%
Mechanical: Pump Failure	44	1.2%	24	55%
Mechanical: Temperature Regulation Device Malfunction	14	0.4%	9	64%
Mechanical: Clots: hemofilter	196	5.5%	116	59%
Mechanical: Air in circuit	168	4.7%	93	55%
Mechanical: Cracks in pigtail connectors	22	0.6%	8	36%
Mechanical: Cannula problems	520	14.6%	331	64%
Mechanical: Circuit change	612	17.1%	403	66%
Mechanical: Clots and Air Emboli	25	0.7%	12	48%
Mechanical: Thrombosis/Clots: circuit component	822	23%	507	62%
Hemorrhagic: GI hemorrhage	160	4.5%	60	38%
Hemorrhagic: Cannulation site bleeding	274	7.7%	178	65%
Hemorrhagic: Surgical site bleeding	267	7.5%	149	56%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	452	12.7%	254	56%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	49	1.4%	13	27%
Hemorrhagic: Peripheral cannulation site bleeding	159	4.5%	103	65%
Hemorrhagic: Mediastinal cannulation site bleeding	55	1.5%	36	65%
Neurologic: Brain death	64	1.8%	0	0%
Neurologic: Seizures: clinically determined	61	1.7%	25	41%
Neurologic: Seizures Confirmed by EEG	87	2.4%	41	47%
Neurologic: CNS Infarction (US or CT or MRI)	132	3.7%	40	30%
Neurologic: CNS hemorrhage by US/CT	156	4.4%	49	31%

	No Reported	% Reported	Survived	% Survived
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	22	0.6%	5	23%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	52	1.5%	17	33%
Neurologic: CNS diffuse ischemia (CT/MRI)	47	1.3%	12	26%
Neurologic: Neurosurgical intervention performed	12	0.3%	4	33%
Renal: Creatinine 1.5 - 3.0	189	5.3%	91	48%
Renal: Creatinine > 3.0	58	1.6%	26	45%
Renal: Renal Replacement Therapy Required	1,057	29.6%	548	52%
Cardiovascular: Inotropes on ECLS	382	10.7%	198	52%
Cardiovascular: CPR required	230	6.4%	82	36%
Cardiovascular: Myocardial stun by echo	15	0.4%	7	47%
Cardiovascular: Cardiac arrhythmia	124	3.5%	59	48%
Cardiovascular: Hypertension requiring vasodilators	212	5.9%	138	65%
Cardiovascular: PDA: R->L	1	0%	0	0%
Cardiovascular: PDA: L->R	1	0%	0	0%
Cardiovascular: Tamponade (blood)	84	2.4%	49	58%
Cardiovascular: Tamponade (not blood)	7	0.2%	3	43%
Pulmonary: Pneumothorax requiring treatment	282	7.9%	142	50%
Pulmonary: Pulmonary hemorrhage	177	5%	65	37%
Infectious: Culture proven infection (see Infections)	148	4.1%	77	52%
Infectious: WBC < 1,500	77	2.2%	27	35%
Metabolic: Glucose < 40	16	0.4%	5	31%
Metabolic: Glucose > 240	107	3%	62	58%
Metabolic: pH < 7.20	111	3.1%	43	39%
Metabolic: pH > 7.60	32	0.9%	19	59%
Metabolic: Hyperbilirubinemia	205	5.7%	58	28%
Metabolic: Moderate hemolysis	410	11.5%	243	59%
Metabolic: Severe hemolysis	250	7%	130	52%
Limb: Ischemia	27	0.8%	7	26%
Limb: Compartment Syndrome	12	0.3%	4	33%
Limb: Fasciotomy	14	0.4%	10	71%
Limb: Amputation	7	0.2%	3	43%

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	704	3,511	258	2,959	409	58%
2012	1,008	4,519	275	6,248	564	55%
2013	1,550	6,069	295	6,745	933	60%
2014	2,095	8,164	298	3,288	1,260	60%
2015	2,407	10,571	279	7,576	1,353	56%
2016	3,151	13,722	309	5,355	1,981	62%
2017	3,537	17,259	276	5,199	2,152	60%
2018	4,187	21,446	281	6,479	2,596	62%
2019	4,956	26,402	292	6,380	3,203	64%
2020	7,917	34,319	466	5,721	4,364	55%

Adult Respiratory Runs by Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Viral pneumonia	789	477	4,150	457	57%
Bacterial pneumonia	961	322	3,985	611	63%
Aspiration pneumonia	193	242	1,575	150	77%
ARDS, postop/trauma	18	212	817	13	72%
ARDS, not postop/trauma	4,288	364	6,479	2,597	60%
Acute resp failure, non-ARDS	1,004	275	4,180	621	61%
Other	15,293	347	5,721	9,135	59%

Note some runs are missing primary diagnoses

Initial Adult Respiratory Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	21,928	358	6,479	13,228	60%
VA	1,414	199	5,009	883	62%
VVA	239	287	2,538	96	40%
Other	67	393	3,580	31	46%
Unknow	9	249	638	5	55%
VP	65	570	2,488	32	49%
	0			0	%

Runs with Conversions - Adult Respiratory Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	299	494	4,703	104	34%
VA to VV	147	386	2,750	93	63%
Other	570	523	4,150	233	40%

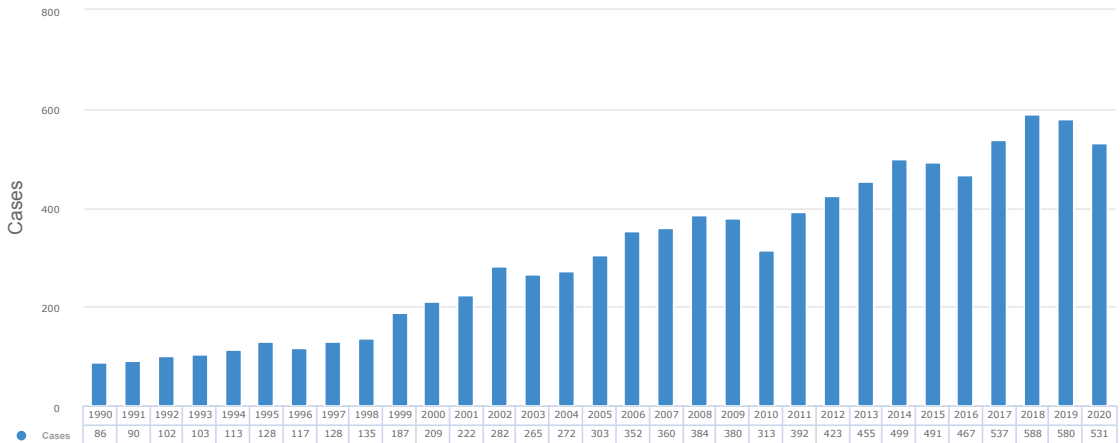
Adult Respiratory Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	2,112	8.9%	1,062	50%
Mechanical: Raceway rupture	2	0%	1	50%
Mechanical: Other tubing rupture	29	0.1%	13	45%
Mechanical: Pump Failure	206	0.9%	93	45%
Mechanical: Temperature Regulation Device Malfunction	17	0.1%	11	65%
Mechanical: Clots: hemofilter	255	1.1%	130	51%
Mechanical: Air in circuit	246	1%	115	47%
Mechanical: Cracks in pigtail connectors	14	0.1%	6	43%
Mechanical: Cannula problems	1,279	5.4%	595	47%
Mechanical: Circuit change	2,512	10.6%	1,353	54%
Mechanical: Clots and Air Emboli	36	0.2%	10	28%
Mechanical: Thrombosis/Clots: circuit component	1,519	6.4%	862	57%
Hemorrhagic: GI hemorrhage	1,338	5.6%	545	41%
Hemorrhagic: Cannulation site bleeding	556	2.3%	299	54%
Hemorrhagic: Surgical site bleeding	1,457	6.1%	725	50%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	520	2.2%	283	54%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	142	0.6%	45	32%
Hemorrhagic: Peripheral cannulation site bleeding	704	3%	345	49%
Hemorrhagic: Mediastinal cannulation site bleeding	76	0.3%	29	38%
Neurologic: Brain death	278	1.2%	0	0%
Neurologic: Seizures: clinically determined	157	0.7%	64	41%
Neurologic: Seizures Confirmed by EEG	76	0.3%	22	29%

	No Reported	% Reported	Survived	% Survived
Neurologic: CNS Infarction (US or CT or MRI)	323	1.4%	82	25%
Neurologic: CNS hemorrhage by US/CT	390	1.6%	111	28%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	182	0.8%	17	9%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	417	1.8%	80	19%
Neurologic: CNS diffuse ischemia (CT/MRI)	104	0.4%	17	16%
Neurologic: Neurosurgical intervention performed	31	0.1%	13	42%
Renal: Creatinine 1.5 - 3.0	2,627	11.1%	1,378	52%
Renal: Creatinine > 3.0	1,240	5.2%	629	51%
Renal: Renal Replacement Therapy Required	6,362	26.8%	2,945	46%
Cardiovascular: Inotropes on ECLS	1,566	6.6%	831	53%
Cardiovascular: CPR required	1,128	4.7%	268	24%
Cardiovascular: Myocardial stun by echo	32	0.1%	16	50%
Cardiovascular: Cardiac arrhythmia	2,012	8.5%	814	40%
Cardiovascular: Hypertension requiring vasodilators	212	0.9%	126	59%
Cardiovascular: PDA: R->L	1	0%	0	0%
Cardiovascular: PDA: L->R	1	0%	1	100%
Cardiovascular: PDA: unknown	1	0%	0	0%
Cardiovascular: Tamponade (blood)	226	1%	99	44%
Cardiovascular: Tamponade (not blood)	41	0.2%	16	39%
Pulmonary: Pneumothorax requiring treatment	1,699	7.2%	714	42%
Pulmonary: Pulmonary hemorrhage	796	3.4%	297	37%
Infectious: Culture proven infection (see Infections)	749	3.2%	407	54%
Infectious: WBC < 1,500	376	1.6%	129	34%
Metabolic: Glucose < 40	75	0.3%	18	24%
Metabolic: Glucose > 240	473	2%	273	58%
Metabolic: pH < 7.20	374	1.6%	119	32%
Metabolic: pH > 7.60	100	0.4%	64	64%
Metabolic: Hyperbilirubinemia	1,209	5.1%	406	34%
Metabolic: Moderate hemolysis	471	2%	221	47%
Metabolic: Severe hemolysis	290	1.2%	113	39%
Limb: Ischemia	251	1.1%	88	35%
Limb: Compartment Syndrome	58	0.2%	19	33%
Limb: Fasciotomy	134	0.6%	50	37%
Limb: Amputation	49	0.2%	27	55%

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	303	2,868	156	1,871	104	34%
2006	352	3,220	141	726	126	35%
2007	360	3,580	153	952	147	40%
2008	384	3,964	149	721	156	40%
2009	380	4,344	158	1,524	161	42%
2010	313	4,657	149	1,099	147	46%
2011	392	5,049	159	3,141	172	43%
2012	423	5,472	149	1,196	197	46%
2013	455	5,927	155	1,400	205	45%
2014	499	6,426	149	1,481	225	45%
2015	491	6,917	158	4,053	220	44%
2016	467	7,384	160	1,676	220	47%
2017	537	7,921	149	1,082	294	54%
2018	588	8,509	152	3,566	307	52%
2019	580	9,089	165	2,109	291	50%
2020	531	9,620	160	1,614	277	52%

Neonatal Cardiac Runs by Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Congenital Defect	1,386	140	1,463	695	50%
Cardiac Arrest	12	131	284	4	33%
Cardiogenic Shock	159	155	1,746	78	49%
Cardiomyopathy	15	465	2,109	7	46%
Myocarditis	10	196	628	6	60%
Other	1,035	177	3,566	559	54%

Note some runs are missing primary diagnoses

Neonatal Cardiac Runs by Congenital Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Left to right shunt (ASD/VSD/PDA/AV canal/AVSD/ECD)	66	139	454	32	48%
Left-sided obstructive (aortic stenosis/mitral stenosis/coarctation)	86	128	430	44	51%
Hypoplastic left heart	408	135	995	185	45%
Right-sided obstructive (pulmonary stenosis/pulmonary or tricuspid atresia)	47	135	862	25	53%
Cyanotic incr. pulmonary flow (truncus arteriosus/TGA/TGV)	62	171	716	26	41%
Cyanotic incr. pulm. congestion (TAP VR/P APVR)	166	132	1,046	78	46%

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Cyanotic decr. pulmonary flow (TOF/DORV/Ebsteins)	333	157	1,463	176	52%
Other	218	127	1,080	129	59%

Note some runs are missing primary diagnoses

Initial Neonatal Cardiac Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	16	142	603	11	68%
VA	2,668	157	3,566	1,370	51%
VVA	17	222	881	7	41%
Other	1	104	104	1	100%
Unknow	1	0	0	0	0%

Runs with Conversions - Neonatal Cardiac Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	2	84	163	0	0%
VA to VV	12	950	3,566	3	25%
Other	11	477	868	4	36%

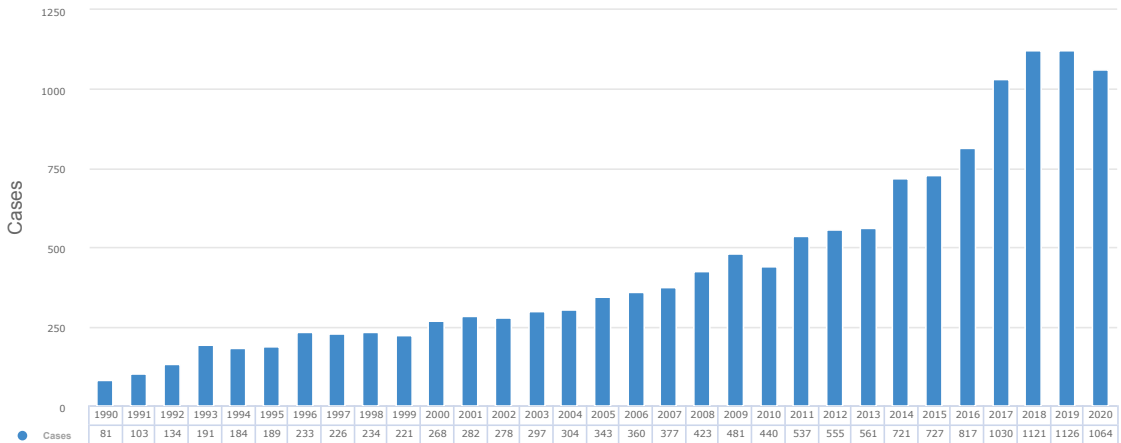
Neonatal Cardiac Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	87	3.2%	23	26%
Mechanical: Raceway rupture	1	0%	0	0%
Mechanical: Other tubing rupture	2	0.1%	1	50%
Mechanical: Pump Failure	21	0.8%	9	43%
Mechanical: Temperature Regulation Device Malfunction	4	0.1%	1	25%
Mechanical: Clots: hemofilter	112	4.1%	37	33%
Mechanical: Air in circuit	84	3.1%	28	33%
Mechanical: Cracks in pigtail connectors	10	0.4%	4	40%
Mechanical: Cannula problems	216	8%	71	33%
Mechanical: Circuit change	267	9.9%	64	24%
Mechanical: Clots and Air Emboli	7	0.3%	3	43%
Mechanical: Thrombosis/Clots: circuit component	536	19.8%	214	40%
Hemorrhagic: GI hemorrhage	36	1.3%	6	17%
Hemorrhagic: Cannulation site bleeding	133	4.9%	46	35%
Hemorrhagic: Surgical site bleeding	444	16.4%	149	34%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	287	10.6%	73	25%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	42	1.6%	6	14%
Hemorrhagic: Peripheral cannulation site bleeding	33	1.2%	12	36%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Mediastinal cannulation site bleeding	263	9.7%	73	28%
Neurologic: Brain death	15	0.6%	0	0%
Neurologic: Seizures: clinically determined	73	2.7%	25	34%
Neurologic: Seizures Confirmed by EEG	158	5.8%	54	34%
Neurologic: CNS Infarction (US or CT or MRI)	90	3.3%	29	32%
Neurologic: CNS hemorrhage by US/CT	195	7.2%	48	25%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	52	1.9%	14	27%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	66	2.4%	19	29%
Neurologic: CNS diffuse ischemia (CT/MRI)	18	0.7%	4	22%
Neurologic: Neurosurgical intervention performed	4	0.1%	2	50%
Renal: Creatinine 1.5 - 3.0	102	3.8%	22	22%
Renal: Creatinine > 3.0	17	0.6%	6	35%
Renal: Renal Replacement Therapy Required	820	30.3%	255	31%
Cardiovascular: Inotropes on ECLS	363	13.4%	139	38%
Cardiovascular: CPR required	64	2.4%	13	20%
Cardiovascular: Myocardial stun by echo	27	1%	3	11%
Cardiovascular: Cardiac arrhythmia	273	10.1%	93	34%
Cardiovascular: Hypertension requiring vasodilators	100	3.7%	53	53%
Cardiovascular: PDA: R->L	1	0%	1	100%
Cardiovascular: PDA: L->R	11	0.4%	6	55%
Cardiovascular: PDA: bidirectional	8	0.3%	3	38%
Cardiovascular: PDA: unknown	2	0.1%	0	0%
Cardiovascular: Tamponade (blood)	89	3.3%	39	44%
Cardiovascular: Tamponade (not blood)	13	0.5%	4	31%
Pulmonary: Pneumothorax requiring treatment	52	1.9%	19	37%
Pulmonary: Pulmonary hemorrhage	62	2.3%	12	19%
Infectious: Culture proven infection (see Infections)	39	1.4%	11	28%
Infectious: WBC < 1,500	23	0.9%	6	26%
Metabolic: Glucose < 40	18	0.7%	6	33%
Metabolic: Glucose > 240	87	3.2%	32	37%
Metabolic: pH < 7.20	79	2.9%	15	19%
Metabolic: pH > 7.60	38	1.4%	17	45%
Metabolic: Hyperbilirubinemia	176	6.5%	50	28%
Metabolic: Moderate hemolysis	132	4.9%	36	27%
Metabolic: Severe hemolysis	89	3.3%	20	22%
Limb: Ischemia	26	1%	6	23%
Limb: Compartment Syndrome	2	0.1%	0	0%
Limb: Amputation	1	0%	1	100%

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	481	5,379	169	3,456	313	65%
2010	440	5,819	146	1,259	227	51%
2011	537	6,356	159	3,605	304	56%
2012	555	6,911	162	2,452	316	56%
2013	561	7,472	201	6,798	309	55%
2014	721	8,193	171	3,506	390	54%
2015	727	8,920	181	2,564	420	57%
2016	817	9,737	174	2,977	473	57%
2017	1,030	10,767	184	3,408	638	61%
2018	1,121	11,888	186	6,194	661	58%
2019	1,126	13,014	165	3,572	662	58%
2020	1,064	14,078	164	6,429	640	60%

Pediatric Cardiac Runs by Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Congenital Defect	1,621	167	6,429	926	57%
Cardiac Arrest	93	145	898	49	52%
Cardiogenic Shock	576	169	3,199	338	58%
Cardiomyopathy	78	200	1,835	49	62%
Myocarditis	107	208	1,746	89	83%
Other	2,458	179	6,194	1,493	60%

Note some runs are missing primary diagnoses

Pediatric Cardiac Runs by Congenital Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Left to right shunt (ASD/VSD/PDA/AV canal/AVSD/ECD)	300	180	1,988	161	53%
Left-sided obstructive (aortic stenosis/mitral stenosis/coarctation)	138	131	1,483	90	65%
Hypoplastic left heart	261	211	6,429	125	47%
Right-sided obstructive (pulmonary stenosis/pulmonary or tricuspid atresia)	58	138	642	40	68%
Cyanotic incr. pulmonary flow (truncus arteriosus/TGA/TGV)	49	155	551	23	46%
Cyanotic incr. pulm. congestion (TAP VR/P APVR)	54	171	874	23	42%

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Cyanotic decr. pulmonary flow (TOF/DORV/Ebsteins)	283	154	1,810	169	59%
Other	478	159	2,089	295	61%

Note some runs are missing primary diagnoses

Initial Pediatric Cardiac Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	47	188	679	29	61%
VA	4,972	171	6,429	2,969	59%
VVA	97	225	1,548	59	60%
Other	40	419	3,242	16	40%
VP	2	192	268	1	50%

Runs with Conversions - Pediatric Cardiac Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	10	123	307	7	70%
VA to VV	52	541	2,720	27	51%
Other	79	468	3,371	37	46%

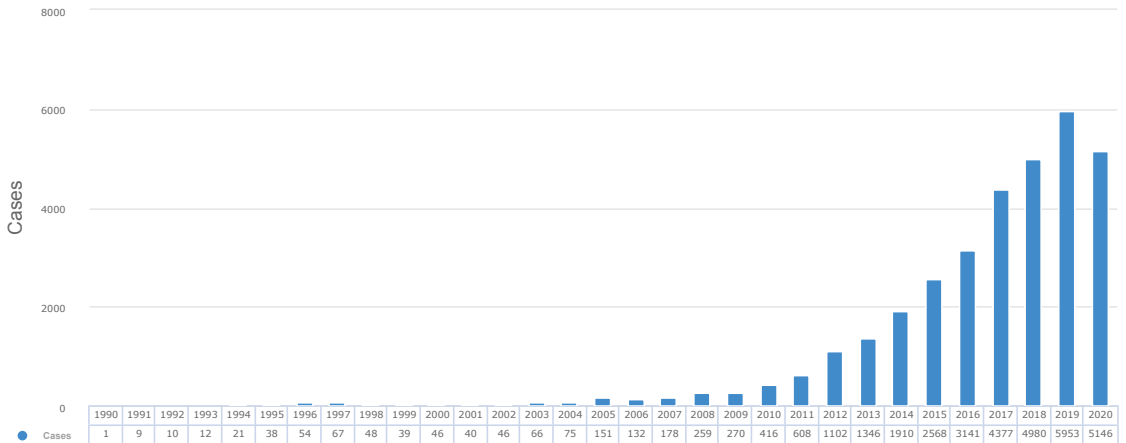
Pediatric Cardiac Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	196	3.8%	88	45%
Mechanical: Raceway rupture	2	0%	0	0%
Mechanical: Other tubing rupture	7	0.1%	2	29%
Mechanical: Pump Failure	50	1%	33	66%
Mechanical: Temperature Regulation Device Malfunction	8	0.2%	5	63%
Mechanical: Clots: hemofilter	130	2.5%	65	50%
Mechanical: Air in circuit	130	2.5%	72	55%
Mechanical: Cracks in pigtail connectors	18	0.3%	7	39%
Mechanical: Cannula problems	406	7.9%	229	56%
Mechanical: Circuit change	466	9%	248	53%
Mechanical: Clots and Air Emboli	15	0.3%	8	53%
Mechanical: Thrombosis/Clots: circuit component	941	18.2%	489	52%
Hemorrhagic: GI hemorrhage	138	2.7%	54	39%
Hemorrhagic: Cannulation site bleeding	301	5.8%	167	55%
Hemorrhagic: Surgical site bleeding	914	17.7%	471	52%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	400	7.8%	136	34%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	51	1%	13	25%
Hemorrhagic: Peripheral cannulation site bleeding	158	3.1%	103	65%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Mediastinal cannulation site bleeding	493	9.6%	244	49%
Neurologic: Brain death	101	2%	0	0%
Neurologic: Seizures: clinically determined	120	2.3%	47	39%
Neurologic: Seizures Confirmed by EEG	172	3.3%	69	40%
Neurologic: CNS Infarction (US or CT or MRI)	268	5.2%	101	38%
Neurologic: CNS hemorrhage by US/CT	169	3.3%	43	25%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	40	0.8%	15	38%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	83	1.6%	25	30%
Neurologic: CNS diffuse ischemia (CT/MRI)	85	1.6%	18	21%
Neurologic: Neurosurgical intervention performed	15	0.3%	3	20%
Renal: Creatinine 1.5 - 3.0	327	6.3%	146	45%
Renal: Creatinine > 3.0	98	1.9%	40	41%
Renal: Renal Replacement Therapy Required	1,526	29.6%	669	44%
Cardiovascular: Inotropes on ECLS	616	11.9%	315	51%
Cardiovascular: CPR required	116	2.2%	32	28%
Cardiovascular: Myocardial stun by echo	45	0.9%	17	38%
Cardiovascular: Cardiac arrhythmia	474	9.2%	247	52%
Cardiovascular: Hypertension requiring vasodilators	237	4.6%	137	58%
Cardiovascular: PDA: R->L	3	0.1%	1	33%
Cardiovascular: PDA: L->R	1	0%	1	100%
Cardiovascular: Tamponade (blood)	163	3.2%	82	50%
Cardiovascular: Tamponade (not blood)	17	0.3%	10	59%
Pulmonary: Pneumothorax requiring treatment	95	1.8%	38	40%
Pulmonary: Pulmonary hemorrhage	168	3.3%	65	39%
Infectious: Culture proven infection (see Infections)	124	2.4%	45	36%
Infectious: WBC < 1,500	63	1.2%	26	41%
Metabolic: Glucose < 40	24	0.5%	8	33%
Metabolic: Glucose > 240	170	3.3%	89	52%
Metabolic: pH < 7.20	104	2%	29	28%
Metabolic: pH > 7.60	36	0.7%	16	44%
Metabolic: Hyperbilirubinemia	278	5.4%	84	30%
Metabolic: Moderate hemolysis	214	4.1%	92	43%
Metabolic: Severe hemolysis	208	4%	46	22%
Limb: Ischemia	92	1.8%	31	34%
Limb: Compartment Syndrome	29	0.6%	13	45%
Limb: Fasciotomy	54	1%	23	43%
Limb: Amputation	19	0.4%	9	47%

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	259	1,298	123	1,296	123	47%
2009	270	1,568	127	871	111	41%
2010	416	1,984	139	2,105	182	43%
2011	608	2,592	139	4,570	225	37%
2012	1,102	3,694	150	2,950	455	41%
2013	1,346	5,040	159	3,066	547	40%
2014	1,910	6,950	161	6,539	809	42%
2015	2,568	9,518	152	2,849	1,094	42%
2016	3,141	12,659	154	2,941	1,380	43%
2017	4,377	17,036	160	6,359	1,910	43%
2018	4,980	22,016	160	4,085	2,252	45%
2019	5,953	27,969	161	4,783	2,866	48%
2020	5,146	33,115	161	2,029	2,432	47%

Adult Cardiac Runs by Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Congenital Defect	185	171	846	80	43%
Cardiac Arrest	414	111	1,013	159	38%
Cardiogenic Shock	7,421	169	4,783	3,354	45%
Cardiomyopathy	178	185	2,116	83	46%
Myocarditis	151	202	1,370	110	72%
Other	13,479	156	6,359	6,352	47%

Note some runs are missing primary diagnoses

Adult Cardiac Runs by Congenital Diagnosis from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
Left to right shunt (ASD/VSD/PDA/AV canal/AVSD/ECD)	64	186	766	24	37%
Left-sided obstructive (aortic stenosis/mitral stenosis/coarctation)	59	157	618	24	40%
Hypoplastic left heart	3	186	312	2	66%
Right-sided obstructive (pulmonary stenosis/pulmonary or tricuspid atresia)	8	190	340	2	25%
Cyanotic incr. pulmonary flow (truncus arteriosus/TGA/TGV)	5	248	846	3	60%
Cyanotic decr. pulmonary flow (TOF/DORV/Ebsteins)	12	140	281	10	83%
Other	34	163	840	15	44%

Note some runs are missing primary diagnoses

Initial Adult Cardiac Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	366	219	2,181	166	45%
VA	22,374	157	6,359	10,300	46%
VVA	496	201	1,829	206	41%
Other	263	226	3,384	124	47%
Unknow	11	143	262	6	54%
Unknown	2	126	230	0	0%
VP	28	257	1,291	10	35%
	0			0	%

Runs with Conversions - Adult Cardiac Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	35	293	1,724	11	31%
VA to VV	658	354	2,709	318	48%
Other	748	330	3,384	295	39%

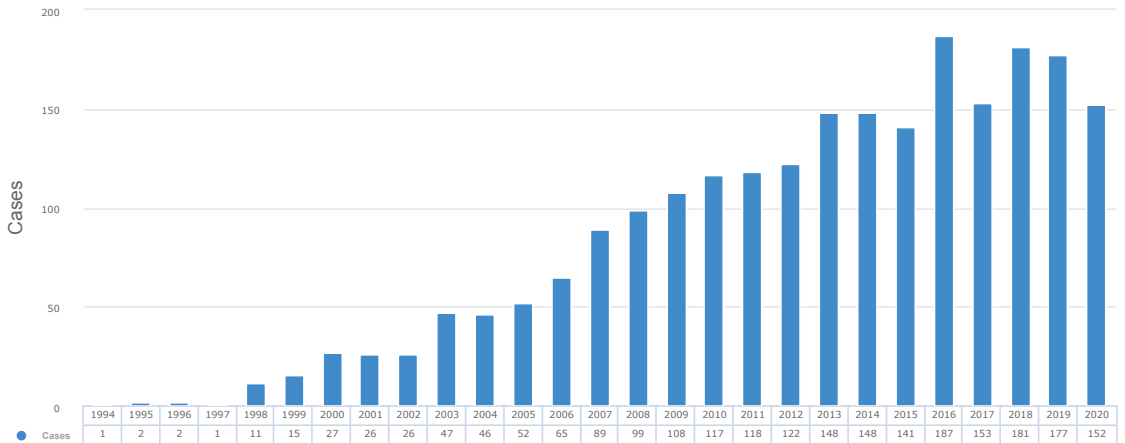
Adult Cardiac Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	654	2.8%	258	39%
Mechanical: Other tubing rupture	12	0.1%	3	25%
Mechanical: Pump Failure	123	0.5%	44	36%
Mechanical: Temperature Regulation Device Malfunction	6	0%	3	50%
Mechanical: Clots: hemofilter	90	0.4%	37	41%
Mechanical: Air in circuit	205	0.9%	49	24%
Mechanical: Cracks in pigtail connectors	25	0.1%	10	40%
Mechanical: Cannula problems	730	3.1%	277	38%
Mechanical: Circuit change	662	2.8%	258	39%
Mechanical: Clots and Air Emboli	22	0.1%	10	45%
Mechanical: Thrombosis/Clots: circuit component	1,255	5.3%	496	40%
Hemorrhagic: GI hemorrhage	980	4.2%	243	25%
Hemorrhagic: Cannulation site bleeding	1,105	4.7%	420	38%
Hemorrhagic: Surgical site bleeding	3,191	13.5%	1,069	34%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	531	2.3%	153	29%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	148	0.6%	22	15%
Hemorrhagic: Peripheral cannulation site bleeding	1,185	5%	518	44%
Hemorrhagic: Mediastinal cannulation site bleeding	765	3.2%	264	35%
Neurologic: Brain death	328	1.4%	0	0%
Neurologic: Seizures: clinically determined	164	0.7%	51	31%
Neurologic: Seizures Confirmed by EEG	110	0.5%	33	30%

	No Reported	% Reported	Survived	% Survived
Neurologic: CNS Infarction (US or CT or MRI)	784	3.3%	169	22%
Neurologic: CNS hemorrhage by US/CT	253	1.1%	30	12%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	86	0.4%	11	13%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	189	0.8%	33	17%
Neurologic: CNS diffuse ischemia (CT/MRI)	216	0.9%	28	13%
Neurologic: Neurosurgical intervention performed	20	0.1%	3	15%
Renal: Creatinine 1.5 - 3.0	3,338	14.1%	1,278	38%
Renal: Creatinine > 3.0	1,780	7.5%	602	34%
Renal: Renal Replacement Therapy Required	6,479	27.5%	2,104	32%
Cardiovascular: Inotropes on ECLS	2,456	10.4%	964	39%
Cardiovascular: CPR required	488	2.1%	75	15%
Cardiovascular: Myocardial stun by echo	209	0.9%	68	33%
Cardiovascular: Cardiac arrhythmia	3,106	13.2%	1,112	36%
Cardiovascular: Hypertension requiring vasodilators	203	0.9%	115	57%
Cardiovascular: PDA: L->R	2	0%	0	0%
Cardiovascular: PDA: bidirectional	1	0%	0	0%
Cardiovascular: Tamponade (blood)	903	3.8%	332	37%
Cardiovascular: Tamponade (not blood)	73	0.3%	22	30%
Pulmonary: Pneumothorax requiring treatment	333	1.4%	111	33%
Pulmonary: Pulmonary hemorrhage	393	1.7%	92	23%
Infectious: Culture proven infection (see Infections)	610	2.6%	246	40%
Infectious: WBC < 1,500	287	1.2%	101	35%
Metabolic: Glucose < 40	78	0.3%	7	9%
Metabolic: Glucose > 240	583	2.5%	259	44%
Metabolic: pH < 7.20	512	2.2%	90	18%
Metabolic: pH > 7.60	175	0.7%	93	53%
Metabolic: Hyperbilirubinemia	1,727	7.3%	464	27%
Metabolic: Moderate hemolysis	252	1.1%	91	36%
Metabolic: Severe hemolysis	181	0.8%	52	29%
Limb: Ischemia	1,042	4.4%	329	32%
Limb: Compartment Syndrome	256	1.1%	64	25%
Limb: Fasciotomy	629	2.7%	211	34%
Limb: Amputation	178	0.8%	86	48%

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	108	617	120	701	46	42%
2010	117	734	127	856	54	46%
2011	118	852	132	924	43	36%
2012	122	974	114	1,041	51	41%
2013	148	1,122	157	3,096	72	48%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2014	148	1,270	144	3,839	64	43%
2015	141	1,411	136	1,010	63	44%
2016	187	1,598	149	747	76	40%
2017	153	1,751	180	1,488	54	35%
2018	181	1,932	125	2,380	95	52%
2019	177	2,109	131	752	87	49%
2020	152	2,261	143	634	62	40%

Initial Neonatal ECPR Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	1	3	3	0	0%
VA	849	145	2,380	374	44%

Runs with Conversions - Neonatal ECPR Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VA to VV	4	388	640	2	50%
Other	8	395	1,077	2	25%

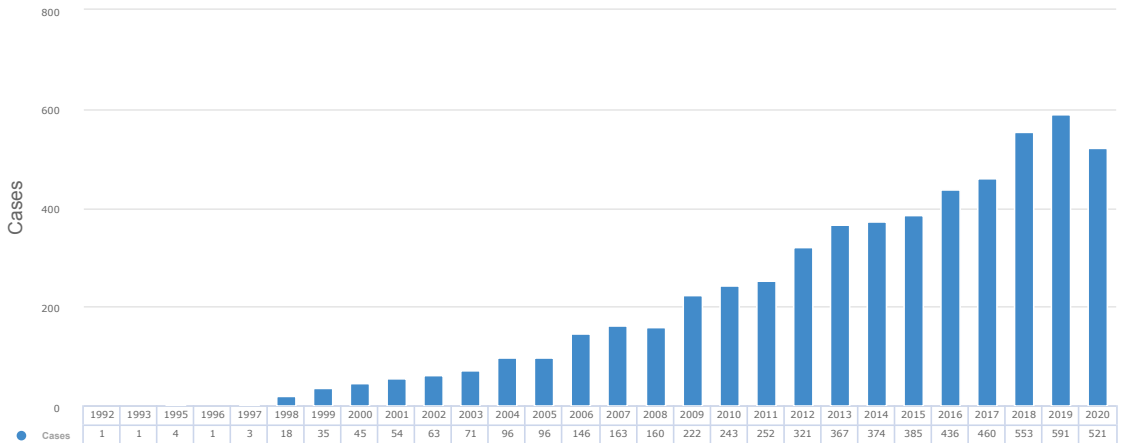
Neonatal ECPR Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	41	4.8%	8	20%
Mechanical: Other tubing rupture	1	0.1%	0	0%
Mechanical: Pump Failure	10	1.2%	3	30%
Mechanical: Clots: hemofilter	21	2.5%	6	29%
Mechanical: Air in circuit	28	3.3%	8	29%
Mechanical: Cracks in pigtail connectors	2	0.2%	1	50%
Mechanical: Cannula problems	77	9.1%	23	30%
Mechanical: Circuit change	61	7.2%	17	28%
Mechanical: Clots and Air Emboli	1	0.1%	1	100%
Mechanical: Thrombosis/Clots: circuit component	160	18.8%	54	34%
Hemorrhagic: GI hemorrhage	13	1.5%	2	15%
Hemorrhagic: Cannulation site bleeding	41	4.8%	11	27%
Hemorrhagic: Surgical site bleeding	117	13.8%	38	32%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	97	11.4%	26	27%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	23	2.7%	5	22%
Hemorrhagic: Peripheral cannulation site bleeding	8	0.9%	4	50%
Hemorrhagic: Mediastinal cannulation site bleeding	113	13.3%	46	41%
Neurologic: Brain death	7	0.8%	0	0%
Neurologic: Seizures: clinically determined	32	3.8%	14	44%

	No Reported	% Reported	Survived	% Survived
Neurologic: Seizures Confirmed by EEG	98	11.5%	28	29%
Neurologic: CNS Infarction (US or CT or MRI)	34	4%	9	26%
Neurologic: CNS hemorrhage by US/CT	79	9.3%	16	20%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	19	2.2%	3	16%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	21	2.5%	5	24%
Neurologic: CNS diffuse ischemia (CT/MRI)	24	2.8%	4	17%
Renal: Creatinine 1.5 - 3.0	35	4.1%	7	20%
Renal: Creatinine > 3.0	4	0.5%	1	25%
Renal: Renal Replacement Therapy Required	287	33.8%	79	28%
Cardiovascular: Inotropes on ECLS	143	16.8%	42	29%
Cardiovascular: CPR required	29	3.4%	5	17%
Cardiovascular: Myocardial stun by echo	7	0.8%	0	0%
Cardiovascular: Cardiac arrhythmia	81	9.5%	24	30%
Cardiovascular: Hypertension requiring vasodilators	51	6%	21	41%
Cardiovascular: PDA: R->L	2	0.2%	1	50%
Cardiovascular: PDA: L->R	3	0.4%	1	33%
Cardiovascular: PDA: bidirectional	1	0.1%	0	0%
Cardiovascular: Tamponade (blood)	26	3.1%	12	46%
Cardiovascular: Tamponade (not blood)	4	0.5%	1	25%
Pulmonary: Pneumothorax requiring treatment	20	2.4%	7	35%
Pulmonary: Pulmonary hemorrhage	28	3.3%	7	25%
Infectious: Culture proven infection (see Infections)	14	1.6%	2	14%
Infectious: WBC < 1,500	6	0.7%	2	33%
Metabolic: Glucose < 40	11	1.3%	4	36%
Metabolic: Glucose > 240	52	6.1%	16	31%
Metabolic: pH < 7.20	52	6.1%	13	25%
Metabolic: pH > 7.60	10	1.2%	1	10%
Metabolic: Hyperbilirubinemia	64	7.5%	17	27%
Metabolic: Moderate hemolysis	43	5.1%	18	42%
Metabolic: Severe hemolysis	57	6.7%	14	25%
Limb: Ischemia	5	0.6%	1	20%
Limb: Compartment Syndrome	2	0.2%	1	50%

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	243	1,422	130	2,900	105	43%
2011	252	1,674	112	944	119	47%
2012	321	1,995	149	4,755	142	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	460	4,017	129	4,281	226	49%
2018	553	4,570	133	3,010	237	42%
2019	591	5,161	125	1,273	242	40%
2020	521	5,682	117	1,210	224	42%

Initial Pediatric ECPR Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	30	178	968	13	43%
VA	2,482	125	4,281	1,079	43%
VVA	37	122	594	13	35%
Other	11	171	352	5	45%
Unknow	1	130	130	1	100%

Runs with Conversions - Pediatric ECPR Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	5	85	153	1	20%
VA to VV	16	574	1,227	7	43%
Other	35	330	2,063	14	40%

Pediatric ECPR Complications from 2016 to 2020

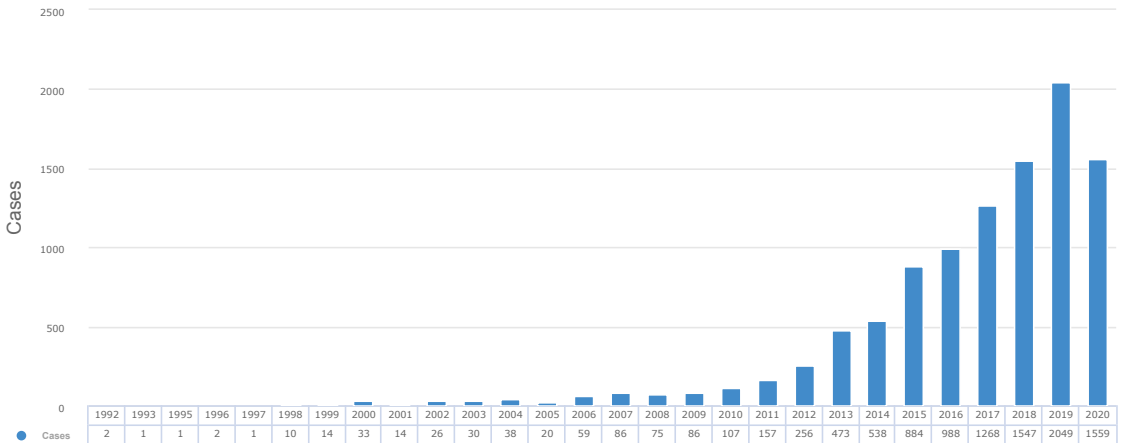
	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	84	3.3%	34	40%
Mechanical: Raceway rupture	3	0.1%	3	100%
Mechanical: Other tubing rupture	4	0.2%	2	50%
Mechanical: Pump Failure	11	0.4%	3	27%
Mechanical: Temperature Regulation Device Malfunction	5	0.2%	3	60%
Mechanical: Clots: hemofilter	46	1.8%	19	41%
Mechanical: Air in circuit	61	2.4%	21	34%
Mechanical: Cracks in pigtail connectors	6	0.2%	3	50%
Mechanical: Cannula problems	196	7.7%	70	36%
Mechanical: Circuit change	150	5.9%	59	39%
Mechanical: Clots and Air Emboli	1	0%	1	100%
Mechanical: Thrombosis/Clots: circuit component	278	10.9%	130	47%
Hemorrhagic: GI hemorrhage	86	3.4%	14	16%
Hemorrhagic: Cannulation site bleeding	146	5.7%	62	42%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Surgical site bleeding	217	8.5%	63	29%
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	147	5.7%	56	38%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	38	1.5%	2	5%
Hemorrhagic: Peripheral cannulation site bleeding	74	2.9%	26	35%
Hemorrhagic: Mediastinal cannulation site bleeding	137	5.3%	57	42%
Neurologic: Brain death	165	6.4%	0	0%
Neurologic: Seizures: clinically determined	154	6%	46	30%
Neurologic: Seizures Confirmed by EEG	245	9.6%	95	39%
Neurologic: CNS Infarction (US or CT or MRI)	225	8.8%	64	28%
Neurologic: CNS hemorrhage by US/CT	125	4.9%	46	37%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	18	0.7%	5	28%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	63	2.5%	23	37%
Neurologic: CNS diffuse ischemia (CT/MRI)	140	5.5%	20	14%
Neurologic: Neurosurgical intervention performed	8	0.3%	2	25%
Renal: Creatinine 1.5 - 3.0	201	7.8%	67	33%
Renal: Creatinine > 3.0	59	2.3%	23	39%
Renal: Renal Replacement Therapy Required	705	27.5%	263	37%
Cardiovascular: Inotropes on ECLS	300	11.7%	114	38%
Cardiovascular: CPR required	96	3.7%	21	22%
Cardiovascular: Myocardial stun by echo	23	0.9%	8	35%
Cardiovascular: Cardiac arrhythmia	233	9.1%	93	40%
Cardiovascular: Hypertension requiring vasodilators	112	4.4%	61	54%
Cardiovascular: PDA: L->R	1	0%	1	100%
Cardiovascular: Tamponade (blood)	41	1.6%	21	51%
Cardiovascular: Tamponade (not blood)	10	0.4%	4	40%
Pulmonary: Pneumothorax requiring treatment	57	2.2%	21	37%
Pulmonary: Pulmonary hemorrhage	120	4.7%	23	19%
Infectious: Culture proven infection (see Infections)	48	1.9%	20	42%
Infectious: WBC < 1,500	14	0.5%	4	29%
Metabolic: Glucose < 40	13	0.5%	4	31%
Metabolic: Glucose > 240	106	4.1%	33	31%
Metabolic: pH < 7.20	88	3.4%	19	22%
Metabolic: pH > 7.60	26	1%	15	58%
Metabolic: Hyperbilirubinemia	82	3.2%	26	32%
Metabolic: Moderate hemolysis	84	3.3%	36	43%
Metabolic: Severe hemolysis	55	2.1%	17	31%
Limb: Ischemia	40	1.6%	11	28%
Limb: Compartment Syndrome	14	0.5%	6	43%
Limb: Fasciotomy	26	1%	13	50%

	No Reported	% Reported	Survived	% Survived
Limb: Amputation	4	0.2%	1	25%

Adult ECPR (18 years and over)

Annual ECPR Adult Runs



Adult ECPR Runs by 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	157	762	106	2,209	41	26%
2012	256	1,018	104	718	64	25%
2013	473	1,491	107	1,368	146	30%

	Annual Runs	Cumulative Runs	Average Run Time	Longest Run Time	No. Survived	% Survived
2014	538	2,029	115	1,662	173	32%
2015	884	2,913	111	1,513	261	29%
2016	988	3,901	109	1,865	261	26%
2017	1,268	5,169	99	2,874	371	29%
2018	1,547	6,716	102	2,892	482	31%
2019	2,049	8,765	104	3,208	657	32%
2020	1,559	10,324	108	1,947	481	30%

Initial Adult ECPR Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV	106	114	1,005	27	25%
VA	7,164	103	3,208	2,186	30%
VVA	105	139	683	29	27%
Other	13	166	600	5	38%
Unknown	5	58	181	0	0%
Unknown	2	39	75	0	0%
	0			0	%

Runs with Conversions - Adult ECPR Support Mode Details from 2016 to 2020

	Total Runs	Avg Run Time	Longest Run Time	Survived	% Survived
VV to VA	10	117	365	3	30%
VA to VV	95	269	1,288	42	44%
Other	158	267	2,892	52	32%

Adult ECPR Complications from 2016 to 2020

	No Reported	% Reported	Survived	% Survived
Mechanical: Oxygenator failure	167	2.3%	47	28%
Mechanical: Other tubing rupture	6	0.1%	1	17%
Mechanical: Pump Failure	35	0.5%	12	34%
Mechanical: Clots: hemofilter	20	0.3%	6	30%
Mechanical: Air in circuit	79	1.1%	15	19%
Mechanical: Cracks in pigtail connectors	3	0%	0	0%
Mechanical: Cannula problems	286	3.9%	56	20%
Mechanical: Circuit change	132	1.8%	39	30%
Mechanical: Clots and Air Emboli	12	0.2%	2	17%
Mechanical: Thrombosis/Clots: circuit component	329	4.4%	119	36%
Hemorrhagic: GI hemorrhage	318	4.3%	56	18%
Hemorrhagic: Cannulation site bleeding	388	5.2%	114	29%
Hemorrhagic: Surgical site bleeding	487	6.6%	128	26%

	No Reported	% Reported	Survived	% Survived
Hemorrhagic: Hemolysis (hgb > 50 mg/dl)	127	1.7%	33	26%
Hemorrhagic: Disseminated intravascular coagulation (DIC)	57	0.8%	6	11%
Hemorrhagic: Peripheral cannulation site bleeding	451	6.1%	153	34%
Hemorrhagic: Mediastinal cannulation site bleeding	109	1.5%	23	21%
Neurologic: Brain death	414	5.6%	0	0%
Neurologic: Seizures: clinically determined	102	1.4%	23	23%
Neurologic: Seizures Confirmed by EEG	102	1.4%	19	19%
Neurologic: CNS Infarction (US or CT or MRI)	321	4.3%	67	21%
Neurologic: CNS hemorrhage by US/CT	110	1.5%	13	12%
Neurologic: Intraventricular CNS hemorrhage (US or CT or MRI)	33	0.4%	6	18%
Neurologic: Intra/extra parenchymal CNS Hemorrhage (US or CT or MRI)	61	0.8%	13	21%
Neurologic: CNS diffuse ischemia (CT/MRI)	277	3.7%	20	7%
Neurologic: Neurosurgical intervention performed	12	0.2%	4	33%
Renal: Creatinine 1.5 - 3.0	986	13.3%	279	28%
Renal: Creatinine > 3.0	483	6.5%	145	30%
Renal: Renal Replacement Therapy Required	1,652	22.3%	424	26%
Cardiovascular: Inotropes on ECLS	695	9.4%	172	25%
Cardiovascular: CPR required	309	4.2%	38	12%
Cardiovascular: Myocardial stun by echo	88	1.2%	21	24%
Cardiovascular: Cardiac arrhythmia	1,082	14.6%	269	25%
Cardiovascular: Hypertension requiring vasodilators	48	0.6%	22	46%
Cardiovascular: PDA: L->R	2	0%	0	0%
Cardiovascular: Tamponade (blood)	141	1.9%	33	23%
Cardiovascular: Tamponade (not blood)	16	0.2%	5	31%
Pulmonary: Pneumothorax requiring treatment	140	1.9%	32	23%
Pulmonary: Pulmonary hemorrhage	144	1.9%	33	23%
Infectious: Culture proven infection (see Infections)	131	1.8%	46	35%
Infectious: WBC < 1,500	53	0.7%	6	11%
Metabolic: Glucose < 40	21	0.3%	1	5%
Metabolic: Glucose > 240	295	4%	83	28%
Metabolic: pH < 7.20	277	3.7%	56	20%
Metabolic: pH > 7.60	35	0.5%	14	40%
Metabolic: Hyperbilirubinemia	260	3.5%	47	18%
Metabolic: Moderate hemolysis	59	0.8%	21	36%
Metabolic: Severe hemolysis	47	0.6%	11	23%
Limb: Ischemia	390	5.3%	97	25%
Limb: Compartment Syndrome	71	1%	23	32%
Limb: Fasciotomy	185	2.5%	53	29%
Limb: Amputation	44	0.6%	18	41%