The 2021 Survey of American Board of Cardiovascular Perfusion Certified Clinical Perfusionists: Workforce Activity and Clinical Trends

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ABSTRACT:

The American Board of Cardiovascular Perfusion (ABCP) is the recognized credentialing body for Certified Clinical Perfusionists (CCPs) in the United States, with approximately 5% of CCPs residing and/or employed internationally. Continuing with the ABCP's ongoing commitment to establish and maintain interactive communication within the community of CCPs, the ABCP asked 16 workforce questions during the 2021 recertification cycle. Of the 4,522 eligible CCPs, 2,708 (59.9%) responded to topics including demographics, clinical activity participation, retirement, and COVID-19 impact. If applicable, responses were compared with available data sets from previous ABCP surveys. The intent of the survey was to present the perfusion community with updated statistics and provide a basis for future survey questions, and possible identification of professional trends.

INTRODUCTION:

Established in 1975, the American Board of Cardiovascular Perfusion (ABCP) strives to develop and maintain quality standards in cardiovascular perfusion that promote safety and protection of the public. As its mission states: these standards include the attainment and enhancement of knowledge, skills, and ethical professional conduct of Certified Clinical Perfusionists (CCPs).[1] This support emanates from the design, implementation, and administration of the credentialing process while fostering innovative educational activities and promoting ethical professional development. As the credentialing body for CCPs in the United States, the ABCP frequently reviews the current state of the profession regarding technology and operational practice of certified practicing perfusionists. The ABCP first sponsored a survey of the CCP workforce during the 2015-2016 ABCP online recertification process. Adhering to the position of responsibility and commitment, an annual survey was again made available to all eligible CCPs during the 2021 annual recertification process. For the 2021 clinical cycle there were 4,655 ABCP certified perfusionists worldwide. Of these, 4,522 were eligible to file for recertification.[2] There were 220 CCPs living/practicing outside of the United States, 200 of which practice solely in Canada.

MATERIALS AND METHODS

Survey Development

In collaboration with the American Academy of Cardiovascular Perfusion (AACP)[3] a strategic assortment of survey questions was compiled to collect existing workforce demographics, clinical experiences, and potential workforce trends. The ABCP Survey Committee, which was comprised of five ABCP directors, developed the form within the SurveyMonkey platform, linked to the online filing system for distribution, and then analyzed results. The ABCP used its annual CCP recertification filing as a platform for the survey, ensuring that the survey was offered to a large, representative sample from the perfusion community. Survey participation was made available as a redirected, separate SurveyMonkey link following recertification completion. Participation was completely voluntary, anonymous, and respondents were given the option to skip or not answer any of the individual queries.

The survey questions focused on gender-identity and age, introduction to the field, career duration, type of employer, clinical roles, caseload, case-variety and level of case-coverage, anticipated time to and reason for retirement, and finally the impact of COVID-19 on their professional activities and plans for the future. Past ABCP surveys and manuscripts were referenced to help identify potential trends in the workforce.[4,5] Though open-ended answers were collected for some questions, individual comments were not included within this manuscript in order to prevent sensitive statements from potentially identifying survey participants.

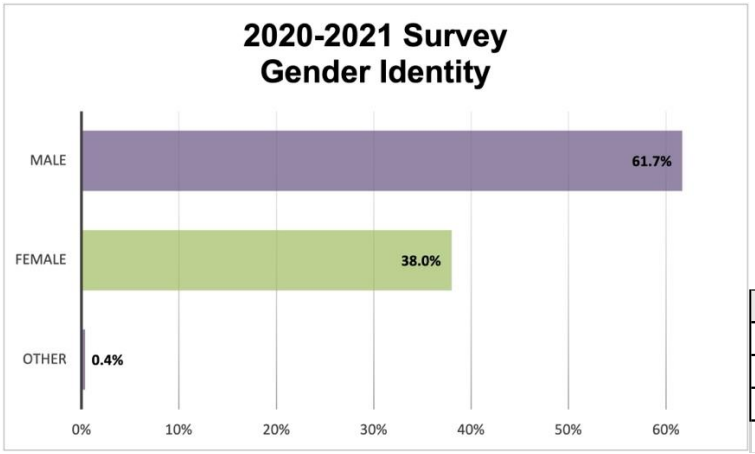
Survey Response

The overall survey response rate was 59.9% (2,708 of 4,522 eligible ABCP certified perfusionists), and the individual question response rate of those submissions varied from 88.6% to 99.5%. Because the survey allowed for respondents to skip individual questions, each completion rate varied slightly.

RESULTS AND DISCUSSION

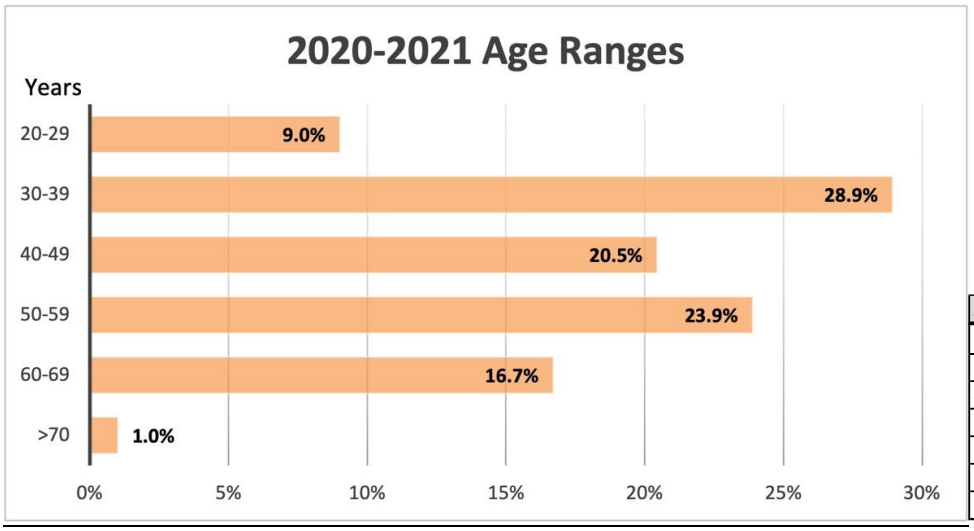
The ABCP certified perfusion workforce in the United States has always been dynamic due to a small number of perfusionists providing a niche, indispensable service to an ever-evolving healthcare industry. As past surveys and studies have indicated [6,7,8], the trajectory of this profession calls for regular monitoring to ensure a properly scaled workforce.[8] The perfusion workforce is influenced externally by patient demographics, disease frequency, and medical advancements. Internal factors include aging of the profession, workplace staffing trends, educational and certification requirements, and advancements in technology.

Gender and Age



Gender Identity	Responses	
Other	0.4%	10
Female	38.0%	1022
Male	61.7%	1659
	Answered	**2691**

Figure 1: 2020-2021 Survey; Gender Identy and Table 1: Gender Identity. A total of 2,691 CCPs answered for Gender Identity. Of those, 61.6% (n=1,659) selected "Male;" 38.0% (n=1,022) selected "Female;" and 0.4% (n=10) identified as "Other."



Age Range	# of CCPs
20-29	238
30-39	764
40-49	540
50-59	631
60-69	441
70-79	27
	2641

Figure 2: 2020-2021 Age Ranges and Table 2: Age Ranges. A total of 2,641 CCPs submitted computable responses for Age. Those that did not submit a realistic numerical response were omitted (6 responses).

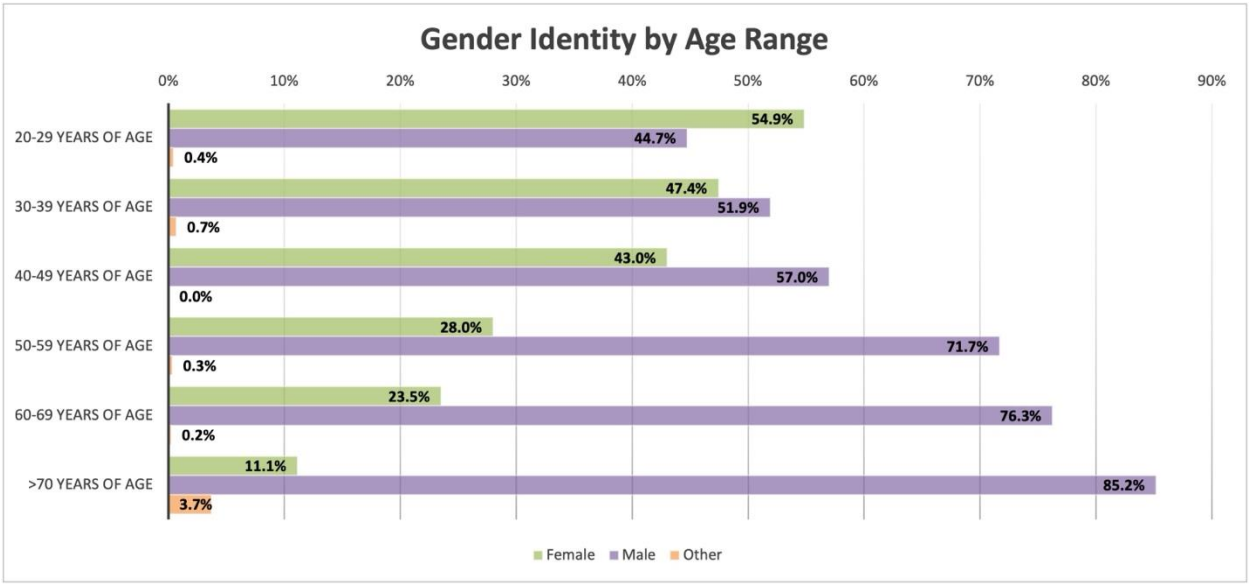


Figure 3: Gender Identity by Age Range.

When Gender Identity and Age were analyzed together there were a total of 2,627 computable responses.

Age Ranges	2020-21 Females	2020-21 Males	2020-21 Other	2020-21 Total
20-29 Years of Age	130	106	1	237
30-39 Years of Age	362	396	5	763
40-49 Years of Age	231	306	0	537
50-59 Years of Age	175	448	2	625
60-69 Years of Age	103	334	1	438
>70 Years of Age	3	23	1	27
	1004	1613	10	2627

Age Ranges	Female	Male	Other	2020-21 Total
20-29 Years of Age	54.9%	44.7%	0.4%	237
30-39 Years of Age	47.4%	51.9%	0.7%	763
40-49 Years of Age	43.0%	57.0%	0.0%	537
50-59 Years of Age	28.0%	71.7%	0.3%	625
60-69 Years of Age	23.5%	76.3%	0.2%	438
>70 Years of Age	11.1%	85.2%	3.7%	27

Table 3: Age Ranges

Gender

The 2021 ABCP survey data revealed that 61.6% of the CCP workforce identified as male, 38.0% as female, and 0.4% as "Other" (Figure 1, Table 1). The male/female percentage gap decreased from 28.6% to 23.6% compared to 2015-2016 ABCP survey data, when the CCP workforce identified as 64.3% male and 35.7% as female.[4] This difference does not include the 0.4% of 2021 respondents who chose "Other" as that option was not included in the previous survey. When compared to even earlier data reported by Brewer and Mongero, where women made up 33.3% of the workforce[6], a slow trend is starting to materialize toward a more gender equal workforce. Over a ten-year time frame from 2011 to 2021 the overall percentage of female identifying CCPs increased from 33.3% [6] to 38.0%.

Age

As seen in Figure 2 and Table 2, the largest group of respondents reported within the range of 30-39 years of age (28.9%), followed by 50-59 years (23.9%). In contrast, CCPs 50-59-years old (29.0%) were the majority category in the 2015-2016 survey.[4] When gender is evaluated within each age range (Figure 3 and Table 3) females made up 54.9% of the 20-29 year age bracket for the 2021 survey , compared to 52.1% of that age group in the 2015-2016 survey, suggesting a possible age-related shift from a once male-dominated profession[5,6] to a balanced or even slightly female-dominated workforce. Also of note,17.7% (n=468) of the survey respondents were over the age of 60, including 1% (n=27) over the age of 70 years old (Figure 2 and Table 2).

Introduction to Perfusion

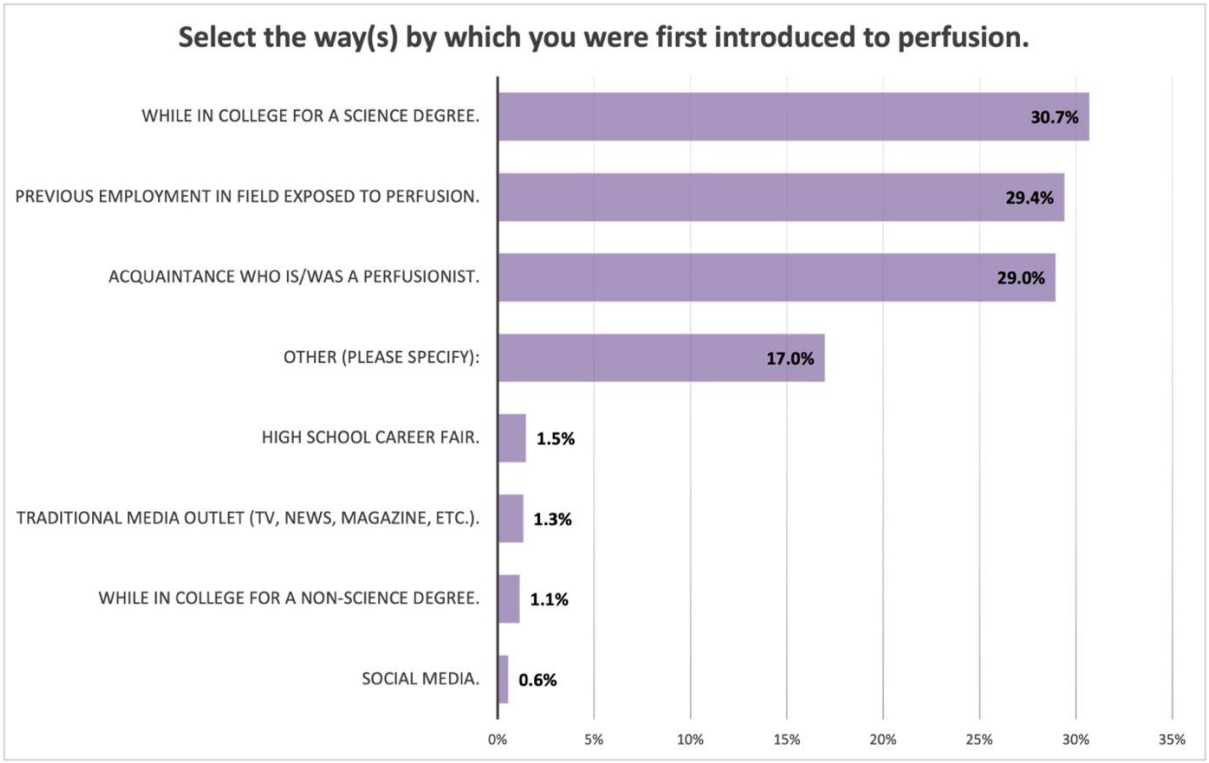


Figure 4: Introduction to Perfusion.

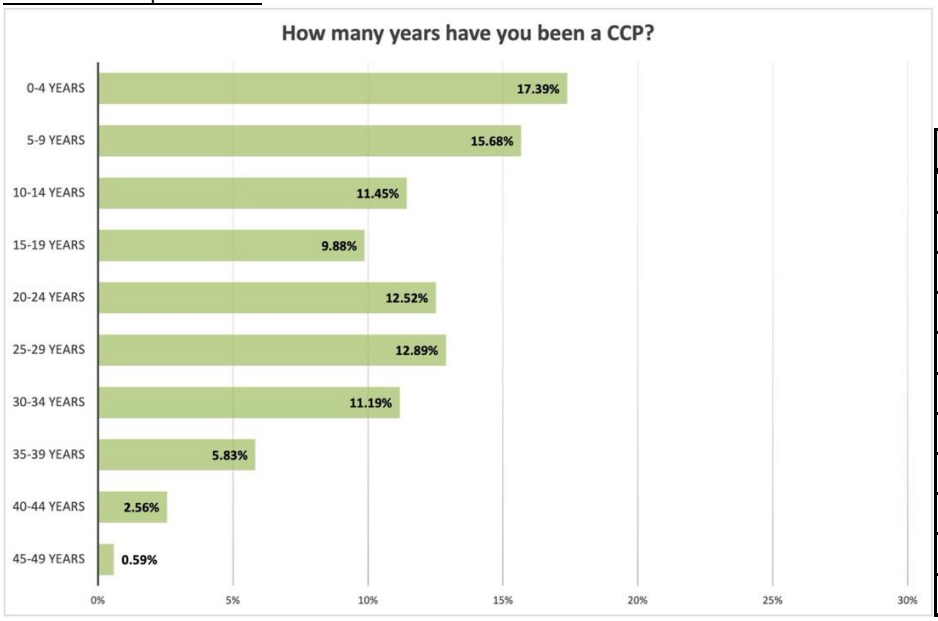
Select the way(s) by which you were first introduced to the field of perfusion. (Select all that apply.)	%	# of CCPs
Social media.	0.6%	15
While in college for a non-science degree.	1.1%	31
Traditional media outlet (TV, news, magazine, etc.).	1.3%	36
High school career fair.	1.5%	40
Other (please specify):	17.0%	458
Acquaintance who is/was a perfusionist.	29.0%	781
Previous employment in field exposed to perfusion.	29.4%	793
While in college for a science degree.	30.7%	828
	Answered	2697

Table 4:Introduction to Perfusion

Introduction to the Field

CCPs responded that they were introduced to the field of perfusion through three major avenues, with 30.7% learning of perfusion while in college for a science degree, 29.4% in a field with exposure to perfusion and 29.0% with an acquaintance who is/was a perfusionist (Figure 4 and Table 2). It is notable that merely 0.6% chose "Social media" considering the breadth and depth of perfusion-related content that has been present across the spectrum of social media outlets. Given that 44.5% (n=1198) of all CCPs who responded to the 2021 survey had been a perfusionist for 14 years or less (Figure 5and Table 5), many would have been exposed to social media outlets while discovering perfusion as a profession. This may be looked at as an area of opportunity for all perfusion entities as it may be underutilized - however, entities attempting to engage potential perfusionists may consider social media a long-term strategy rather than one with noticeable quick returns.

Years of Experience



Years as CCP	# of CCPs
0-4 years	468
5-9 years	422
10-14 years	308
15-19 years	266
20-24 years	337
25-29 years	347
30-34 years	301
35-39 years	157
40-44 years	69
45-49 years	16
	2691

Figure 5 and Table 5: Years of Experience.

A total of 2,691 CCPs responded to how many years of experience they held as a CCP.

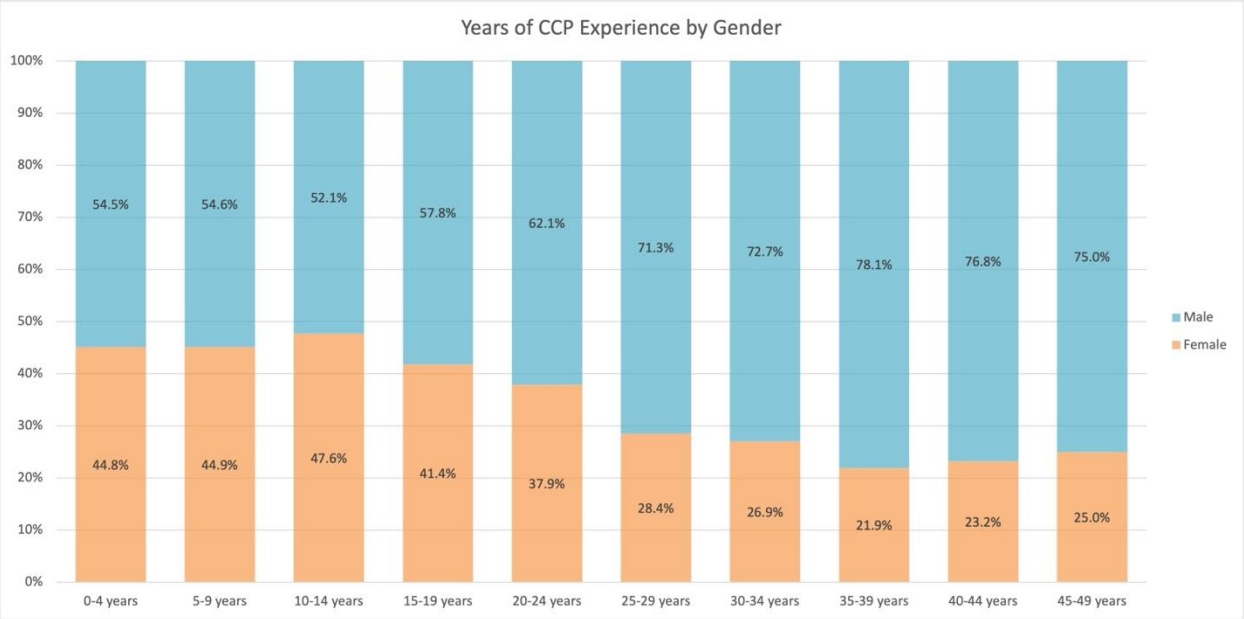


Figure 6: Years of Experience and Gender Identity.

Years of Experience	Female (n)	Female %	Male (n)	Male %	Other (n)	Other %	Sum (n)	Sum %
0-4 years	209	44.8%	254	54.5%	3	0.6%	466	17.40%
5-9 years	189	44.9%	230	54.6%	2	0.5%	421	15.70%
10-14 years	146	47.6%	160	52.1%	1	0.3%	307	11.50%
15-19 years	109	41.4%	152	57.8%	2	0.8%	263	9.80%
20-24 years	127	37.9%	208	62.1%	0	0.0%	335	12.50%
25-29 years	98	28.4%	246	71.3%	1	0.3%	345	12.90%
30-34 years	80	26.9%	216	72.7%	1	0.3%	297	11.10%
35-39 years	34	21.9%	121	78.1%	0	0.0%	155	5.80%
40-44 years	16	23.2%	53	76.8%	0	0.0%	69	2.60%
45-49 years	4	25.0%	12	75.0%	0	0.0%	16	0.60%

Table 6: Years of Experience and Gender Identity

Years of Experience as a CCP

A total of 2,674 CCPs responded for both years of experience and gender identity. The respondents were graphed by years of experience, and then gender identity within each range was compared.

CCPs with greater than 25 years of experience made up 33.1% of respondents (Figure 5 and Table 5) compared with 27.5% in 2015-2016,[4] confirming extended longevity in the workforce. Respondents with 0-4 years of workforce experience comprised 17.4% of the total (Figure 5 and Table 5), compared to 16.6% in 2015-2016[4]. This coincides with perfusion schools graduating more students into the marketplace since the 2017 ABCP Survey.[5,9.] The most recent survey

(Figure 6) reveals an increased gender gap as CCP experience level increased, which appears to be consistent with previously reported findings.

Primary Employment

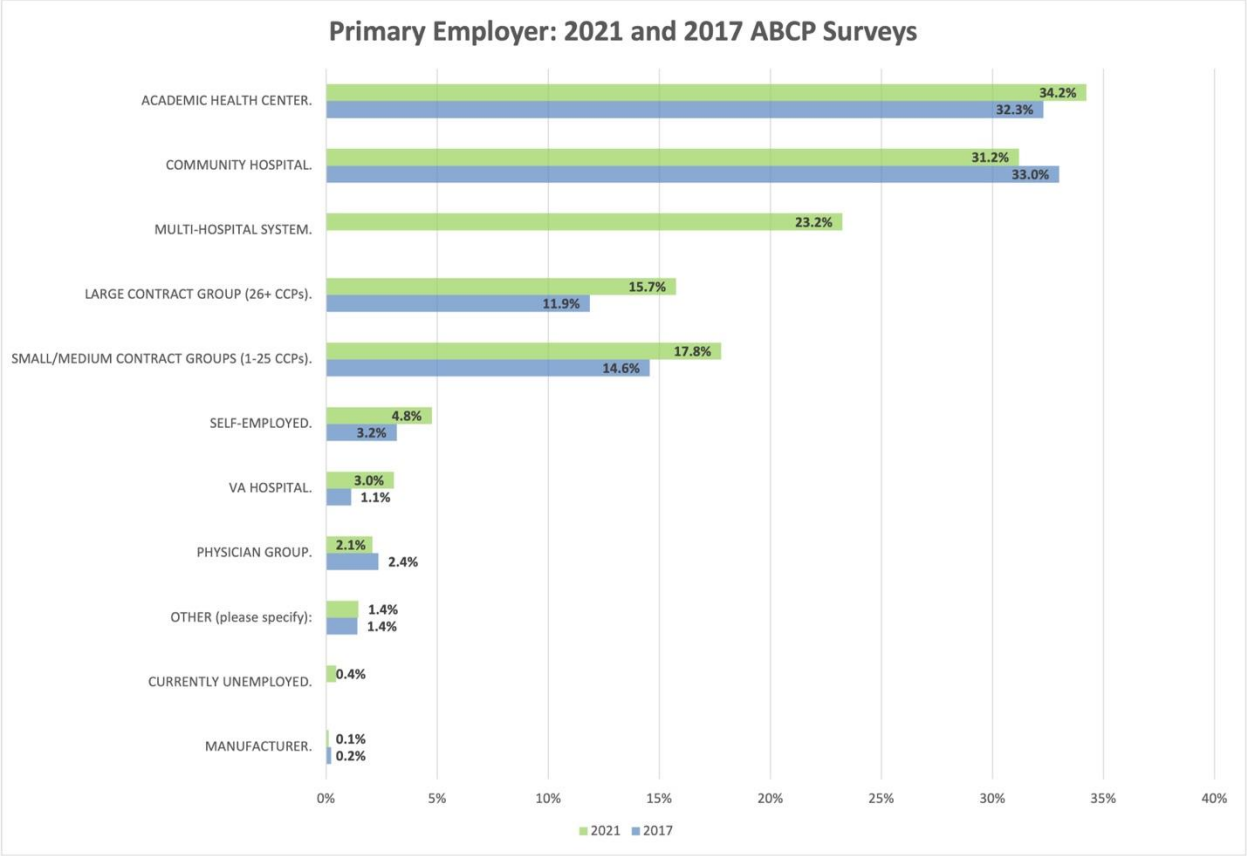


Figure 7: Primary Employment: 2021 vs. 2017.

	2021		2017	
ACADEMIC HEALTH CENTER.	34.2%	922	32.3%	1039
COMMUNITY HOSPITAL.	31.2%	840	33.0%	1062
MULTI-HOSPITAL SYSTEM.	23.2%	626		
SMALL/MEDIUM CONTRACT GROUPS (1-25 CCPs).	17.8%	479	14.6%	469
LARGE CONTRACT GROUP (26+ CCPs).	15.7%	424	11.9%	382
SELF-EMPLOYED.	4.8%	128	3.2%	102
VA HOSPITAL.	3.0%	82	1.1%	36
PHYSICIAN GROUP.	2.1%	56	2.4%	76
OTHER (please specify):	1.4%	39	1.4%	45
CURRENTLY UNEMPLOYED.	0.4%	12		
MANUFACTURER.	0.1%	3	0.2%	7

Table 7: Primary Employment: 2021 vs. 2017

Type of Primary Employment

A total of 2,693 CCPs submitted primary employment selections in the 2021 ABCP Survey compared to 3,218 in the 2017 ABCP Survey (Table 7). The 2021 respondents selected all primary employment options that applied, while the 2017 Survey asked to make one primary selection. Note that the options for "currently unemployed, and "multi-hospital system" were not available for the 2017 Survey. The breakdown of data for both 2017 and 2021 primary employment can be viewed in Figure 7 and Table 7.

The majority of respondents for the 2020-2021 Survey chose community hospitals (31.2%), academic health centers (34.2%), and multi-hospital systems (23.2%) as their primary employer, which has also been demonstrated in previously published workforce surveys[8]. Contract group employees comprised 33.4% of respondents for the 2020-2021 Survey. Comparatively, the 2017 ABCP Survey showed 26.5% of the workforce employed by contract groups (Figure 7).[5] The remaining CCPs who responded were evenly spaced across the other options. The percentage of self-employed CCPs rose from 3.2% to 4.8% from 2017 to 2021. Twelve respondents indicated they were currently unemployed; however, the survey would not have captured unemployed CCPs who have chosen to leave the field permanently, therefore not submitting for recertification.[10]

Professional Role

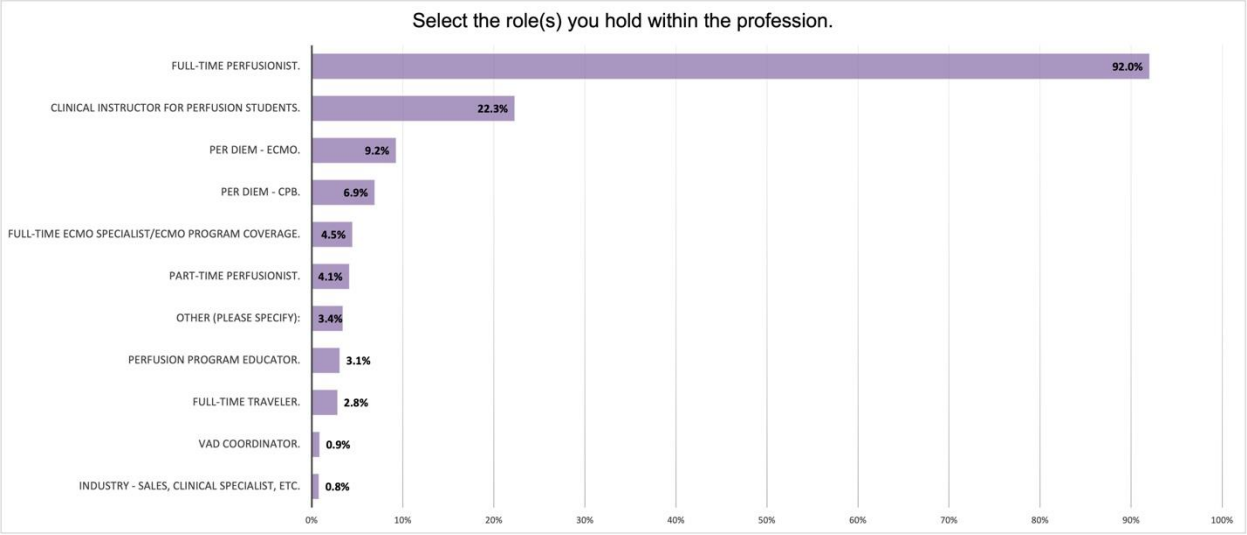


Figure 8: Roles within the Perfusion Profession.

Answer Choices	Responses	
Full-time perfusionist.	92.0%	2477
Clinical instructor for perfusion students.	22.3%	600
Per diem - ECMO.	9.2%	249
Per diem - CPB.	6.9%	186
Full-time ECMO specialist/ECMO program coverage.	4.5%	120
Part-time perfusionist.	4.1%	111
Other (please specify):	3.4%	92
Perfusion program educator.	3.1%	83
Full-time traveler.	2.8%	76
VAD coordinator.	0.9%	23
Industry - sales, clinical specialist, etc.	0.8%	21

Table 8: Roles within the Perfusion Profession * A total of 2,692 CCPs selected their professional role(s) allowing for multiple selections.

Full-time perfusionist.	2477	92.0%
Other Roles Selected by Full-time Perfusionists:	Count	Percentage
Clinical instructor for perfusion students.	573	23.1%
Per diem - ECMO.	185	7.5%
Per diem - CPB.	114	4.6%
Full-time ECMO specialist/ECMO program coverage.	112	4.5%
Other (please specify):	74	3.0%
Perfusion program educator.	67	2.7%
Full-time traveler.	31	1.3%
VAD coordinator.	21	0.8%
Part-time perfusionist.	19	0.8%
Industry - sales, clinical specialist, etc.	15	0.6%

Table 9: Additional roles of Full-time Perfusionists. CCP respondents who selected Full-time (n=2,477) also selected these roles within the profession, comprising 1,211 additional responsibilities.

Professional Role

The question querying professional roles in the 2020-2021 survey allowed CCPs to select multiple answers to describe their status (Figure 8 and Tables 8 and 9). A majority (92.0%) chose "Full-time Perfusionist" (Figure 8 and Table 8), and of those, 48.9% (n=1211) also chose an additional role (Table 9) suggesting that many CCPs are utilizing multiple opportunities to apply perfusion expertise.

Clinical instructors made up 22.3% of question respondents (Table 8), which extrapolates to approximately 1000 clinical perfusion instructors available to AC-PE accredited perfusion programs. This number of clinical instructors is compelling when considering the number of

students actively enrolled in perfusion programs in 2021 would be extrapolated to approximately 400, based on the approximate number of 200 new ABCP certificates granted the year prior.[9] This data does not indicate, however, how many clinical sites are covered by the 1000 self-identified clinical instructors.

2021 Procedure Participation

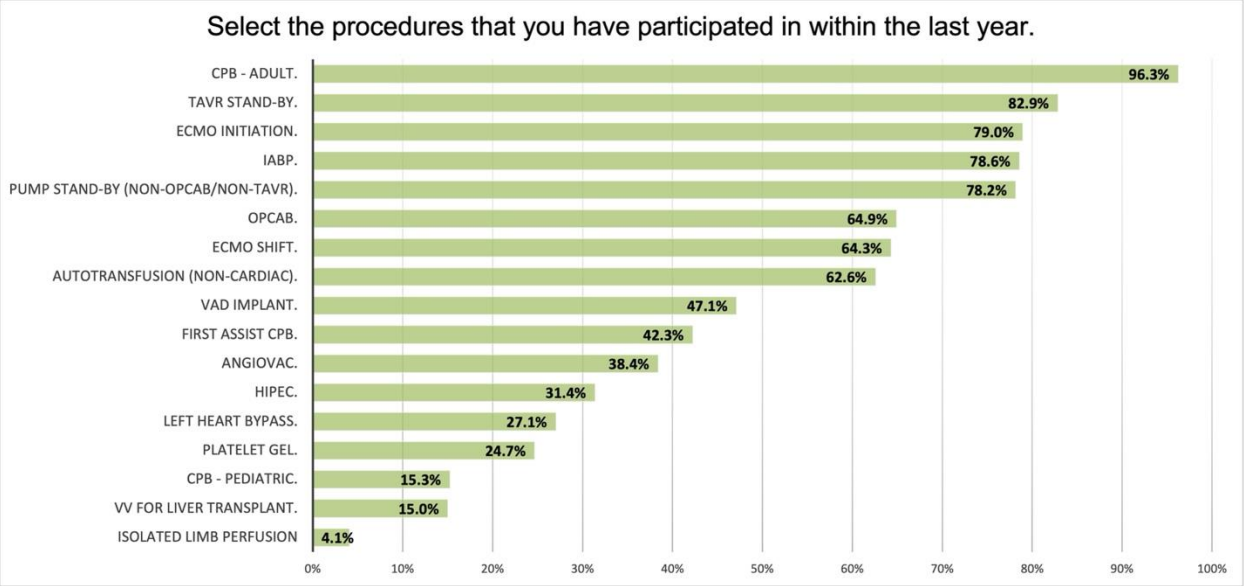


Figure 9: Procedure Participation.

A total of 2,695 CCPs provided input regarding procedure participation.

Answer Choices	Responses	
CPB - adult.	96.3%	2594
TAVR stand-by.	82.9%	2233
ECMO initiation.	79.0%	2128
IABP.	78.6%	2118
Pump stand-by (non-OPCAB/non-TAVR).	78.2%	2107
OPCAB.	64.9%	1750
ECMO shift.	64.3%	1733
Autotransfusion (non-cardiac).	62.6%	1687
VAD implant.	47.1%	1270
First assist CPB.	42.3%	1139
Angiovac.	38.4%	1035
HIPEC.	31.4%	846
Left heart bypass.	27.1%	729
Platelet gel.	24.7%	665
CPB - pediatric.	15.3%	411
VV for liver transplant.	15.0%	405
Isolated limb perfusion	4.1%	110

Table 10: Procedure Participation

Procedures within the 2020-2021 recertification cycle:

ABCP certified perfusionists were offered 14 case-types to choose from and 2,695 respondents (99.5%) provided answers (Figure 9 and Table 9). Multiple selections were allowed from the 14

choices creating a very large set of data with compound variability. The vast majority of CCPs participated in adult CPB cases (96.3%), TAVRs (82.9%), ECMO Initiation (79.0%) and IABPs (78.6%). Less than a third of CCPs participated in more specialized procedures including HIPEC (31.4%), Left Heart Bypass (27.1%), Platelet Gel (24.7%), Pediatric CPB (15.3%), VV Bypass (15.0%), and Isolated Limb Procedures (4.1%).

ECMO Coverage

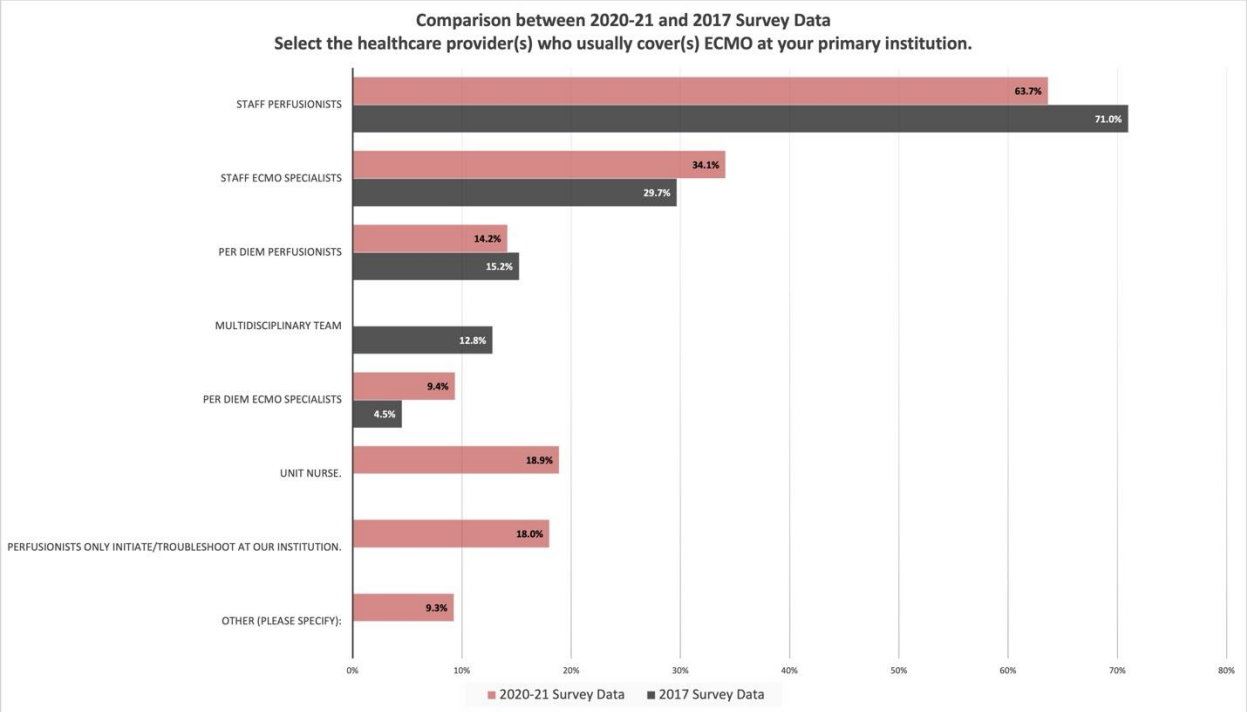


Figure 10: ECMO Coverage: 2021 vs. 2017.

Answer Choices	2020-21		2017	
Staff perfusionists	63.7%	1650	71.0%	1840
Staff ECMO specialists	34.1%	885	29.7%	769
Per diem perfusionists	14.2%	367	15.2%	395
Multidisciplinary team			12.8%	332
Per diem ECMO specialists	9.4%	243	4.5%	117
Unit nurse.	18.9%	490		
Perfusionists only initiate/troubleshoot at our institution.	18.0%	467		
Other (please specify):	9.3%	240		

Table 11: ECMO Coverage: 2021 vs. 2017

ECMO Coverage

Regular ECMO coverage at the respondent's primary institution was provided by staff perfusionists according to 63.7% (Figure 10) of respondents, while in 2017, 71% of respondents chose staff perfusionists. An additional 14.2% selected per diem perfusionists and 18.0% indicated CCP involvement only for initiations and troubleshooting. Staff ECMO specialists were

chosen by 34.1% of respondents with an additional 9.4% indicating per diem ECMO specialists providing shift coverage. By contrast, staff ECMO specialists were chosen 29.7% in 2017 (Figure 10 and Table 11).[5] It is important to note, however, that the credentials and professional backgrounds of "ECMO Specialists" may be unique to each facility, and the surveys did not distinguish beyond the selected options for this question. This development, however, may indicate a trend toward increased ECMO staffing by non-CCP specialists, possibly in place of full time ECMO support by perfusionists.

Mechanical Circulatory Support Coverage

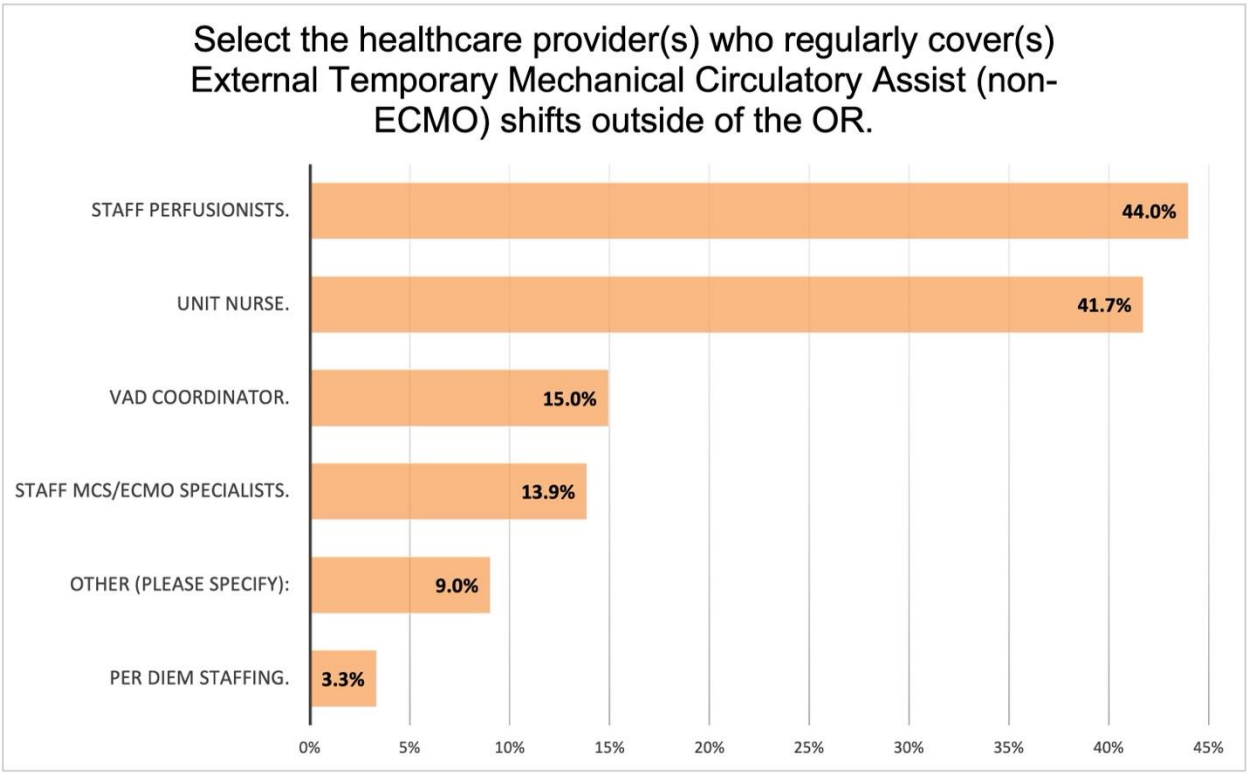


Figure 11: Mechanical Circulatory Assist Coverage (non-ECMO).

Answer Choices	Responses	
Staff perfusionists.	44.0%	1056
Unit nurse.	41.7%	1002
VAD coordinator.	15.0%	359
Staff MCS/ECMO specialists.	13.9%	333
Other (please specify):	9.0%	217
Per diem staffing.	3.3%	80

Table 12: Mechanical Circulatory Assist Coverage (non-ECMO).

External Temporary Mechanical Circulatory Assist (MCS) Coverage

Similar to ECMO coverage (Figure 10), Figure 11 shows that staff perfusionists provided the highest percentage of mechanical assist coverage (44.0%) in the 2020-2021 survey. However, unit nurses took on a much larger role for non-ECMO circulatory support devices; 41.7% compared to 18.9%. VAD Coordinators provided coverage for 15%, followed by MCS/ECMO specialists (13.9%). There does appear to be a shift in coverage responsibilities depending on type of mechanical support (ECMO vs different MCS devices) within institutions.[6]

Transcatheter Valves

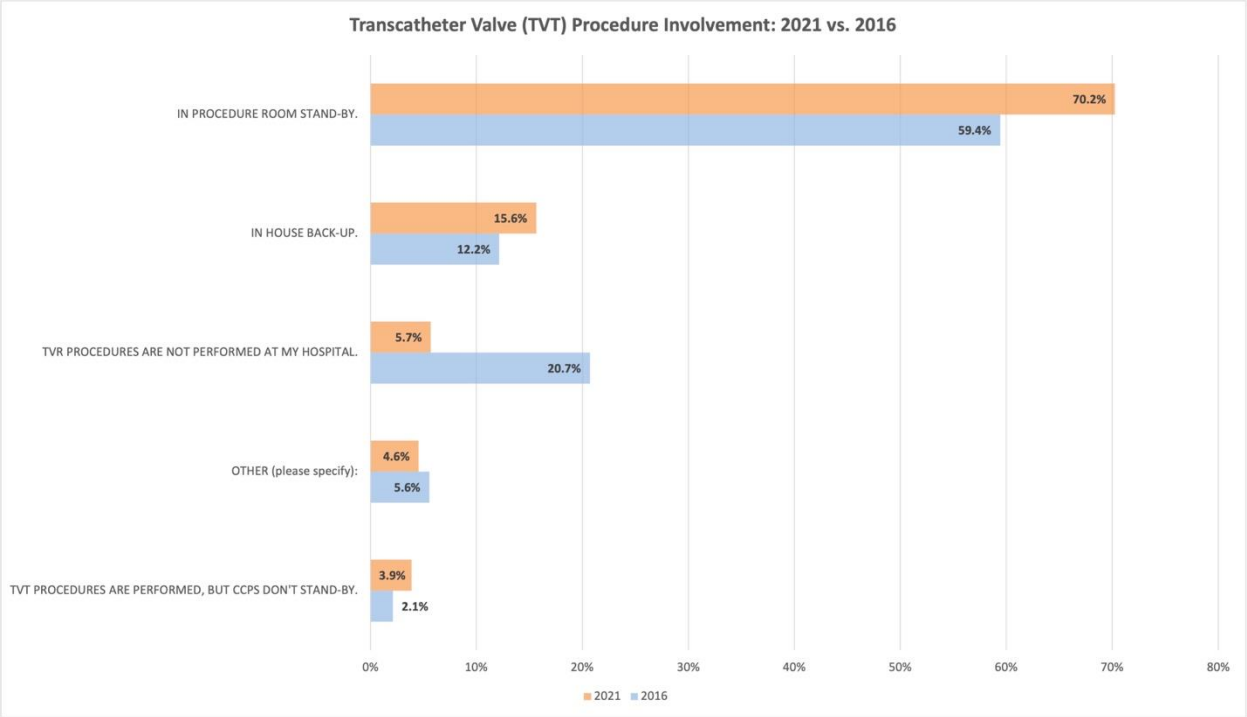


Figure 12: Transcatheter Valve Coverage: 2021 vs. 2016.

In 2021 a total of 2,615 CCPs responded regarding perfusionist involvement in a transcatheter valve (TVT) program. In 2016 a total of 2,911 CCPs answered, reflected by in Figure 12 and Table 13.

Transcatheter Valve Procedure Involvement	2016		2021	
TVT PROCEDURES ARE PERFORMED, BUT CCPS DON'T STAND-BY.	2.1%	62	3.9%	101
OTHER (please specify):	5.6%	162	4.6%	119
TVR PROCEDURES ARE NOT PERFORMED AT MY HOSPITAL.	20.7%	603	5.7%	149
IN HOUSE BACK-UP.	12.2%	354	15.6%	409
IN PROCEDURE ROOM STAND-BY.	59.4%	1730	70.2%	1837

Table 13: Transcatheter Valve Coverage: 2021. S. 2016

Transcatheter Valve (TVT) Program Involvement

2021 TVT coverage was compared to the 2015-2016 ABCP Survey with some variation in responses.[4] Figure 12 and Table 13 shows a significant decrease in respondents who indicated that they did not perform TVT procedures at their institution, dropping from 20.7% in 2016, to 5.7%. This demonstrates an increase in widespread application of transcatheter valve procedures and provides a strong, indirect indication that stand alone valve surgery with CPB has declined with more patients referred for TVT within the past 4 years.[11] One milestone in TVT that may have contributed to a marked increase in such cases was FDA approval for TVT in "Low Risk" patients in August 2019.[12]

CPB Coverage

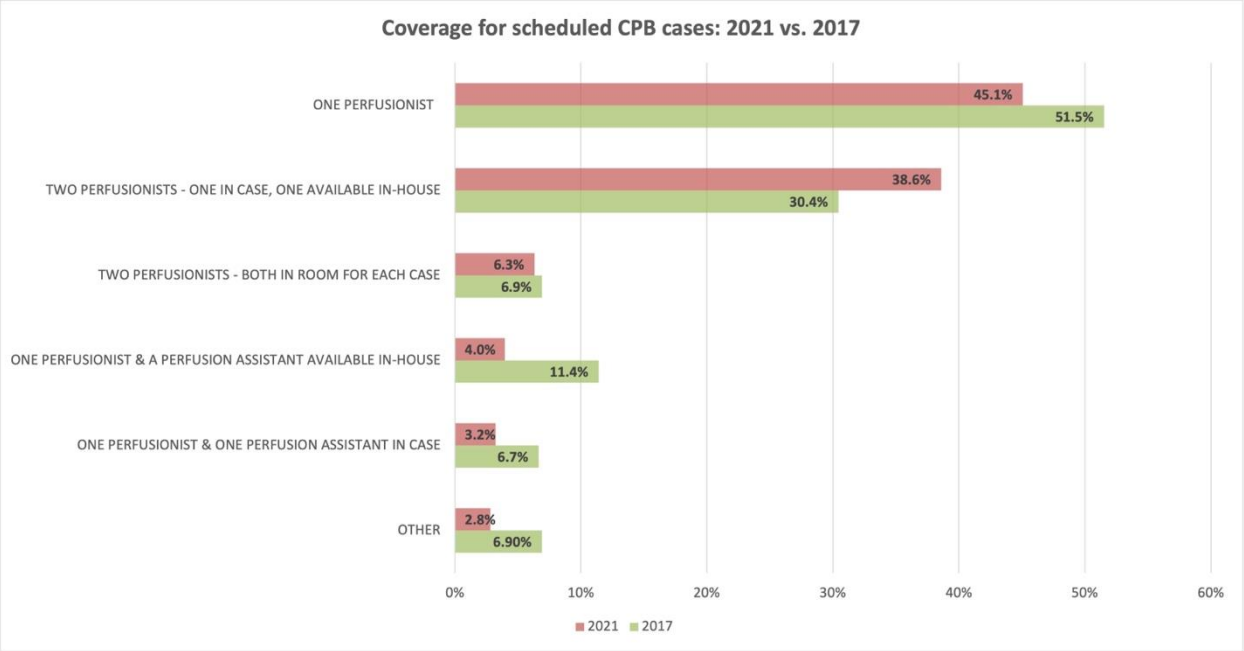


Figure 13. CPB Coverage for scheduled CPB cases: 2021 vs. 2017.

In 2021, 2,669 CCPs selected responses regarding coverage available for regularly scheduled CPB cases. A total of 2,934 CCPs answered this 2017 question.

Select the type of coverage available for a regularly scheduled CPB case at your primary place of employment.	2017		2021	
ONE PERFUSIONIST	51.5%	1512	45.1%	1203
TWO PERFUSIONISTS - ONE IN CASE, ONE AVAILABLE IN-HOUSE	30.4%	893	38.6%	1030
TWO PERFUSIONISTS - BOTH IN ROOM FOR EACH CASE	6.9%	203	6.3%	169
ONE PERFUSIONIST & A PERFUSION ASSISTANT AVAILABLE IN-HOUSE	11.4%	335	4.0%	106
ONE PERFUSIONIST & ONE PERFUSION ASSISTANT IN CASE	6.7%	195	3.2%	86
OTHER	6.90%	201	2.8%	75

Table 14: CPB Coverage for scheduled CPB cases: 2021 vs. 2017

Scheduled CPB Coverage

Standard CPB coverage as shown in Figure 13 and Table 14 reflect case staffing levels. Of those who responded in 2020-2021, just under half (45.1%) of CCPs reported one perfusionist covering each CPB case without available in-house backup. The second highest response category, 38.6%, selected one perfusionist in the case and an additional perfusionist available in-house, which would reflect the n+1 model staffing guidelines outlined in AmSECT's Standards and Guidelines for Perfusion Practice.[13] The n+1 staffing model suggestion is not unique to practicing perfusionists in the United States and is also recommended in the 2019 EACTS/EACTA/EBCP Guidelines on Cardiopulmonary Bypass in Adult Cardiac Surgery, published by the European Journal of Cardio-Thoracic Surgery.[14] The n+1 staffing model is also suggested in the 2019 Scope of Practice document of the Society of Clinical Perfusion Scientists of Great Britain and Ireland[15]. When compared to 2017 ABCP Survey results[5] (Figure 13 and Table 14), 51.5% of respondents were alone during a CPB case and 30.4% had a floating perfusionist as backup. While this may indicate a trend moving toward the n+1 model, that guideline has not been adopted universally. There are, however, many contributing factors involved with staffing numbers, including caseload, type and variety, number of surgeons, staff shortages, administrative support (or lack thereof), and available resources.

Retirement from Perfusion Profession

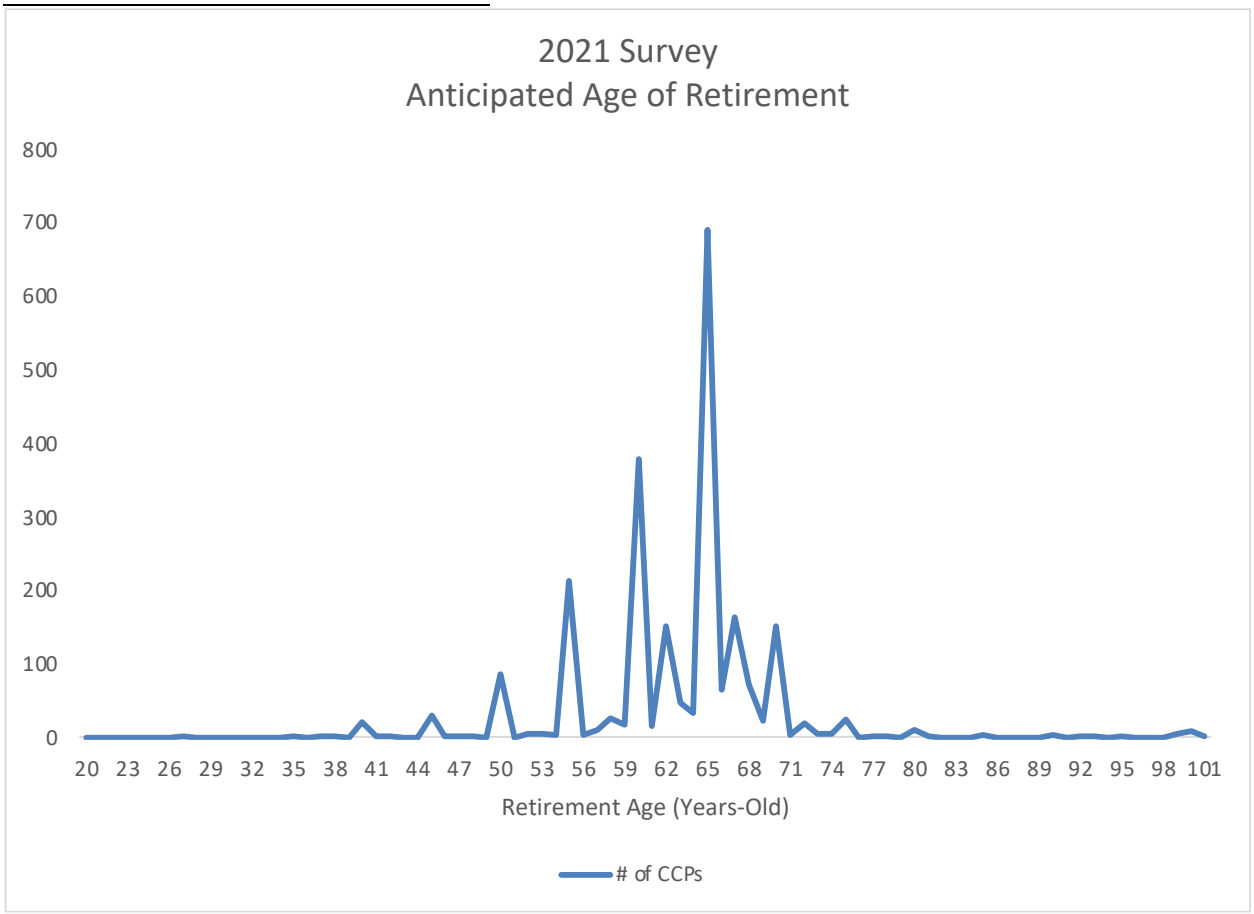


Figure 14. Anticipated Age of Retirement from Perfusion Profession.

There were 2,592 initial respondents to the 2020-2021 question; “At what age do you expect to retire/leave the profession?”. After reviewing the data, 269 responses were omitted due to text (alpha) entries rather than numerical submissions, date range submissions, or clear indications of unsure answer. This allowed for 2,323 data points to be entered for a response rate of 85.8%.

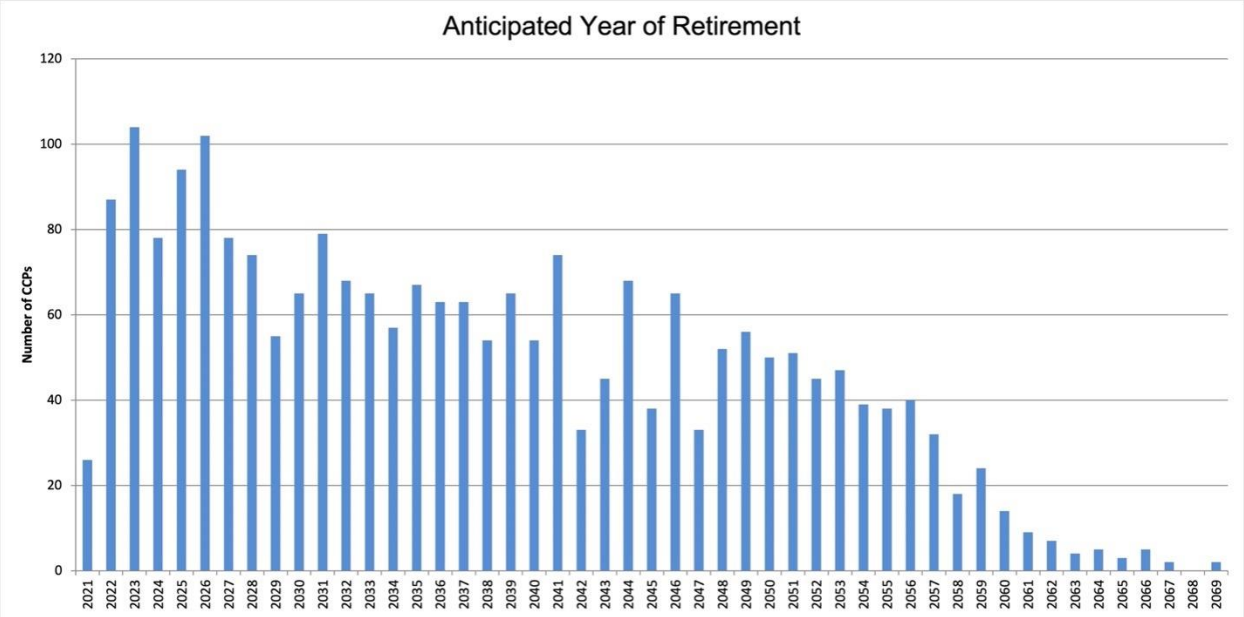


Figure 15: Anticipated Year of Retirement from Perfusion Profession

A total of 2297 responses provided data points for Figure 15. The Anticipated year of retirement represented on this chart was created using 2020-2021 Survey Question 2: Age, and Question 13: What age do you expect to retire. The difference of these in years was added to 2021 to calculate the year each of the respondents would be retiring based on their answers. After reviewing the data, 411 responses were omitted due incomplete or incorrect data submission.

Anticipated Retirement/Leaving the profession

Figure 14 and Figure 14 represent anticipated retirement data. After analyzing all computable responses, Figure 14 represents that the majority (54.3%) of CCPs anticipate practicing until the age of 65, while 81.1% anticipated staying until age 60. While this data is based on a speculative retirement age it suggests a stability in career choice, with most CCPs project staying in the perfusion profession until retirement eligibility as opposed to a career change.

Because age of respondent (Figure 2) was asked of survey participants prior to inquiring about their anticipated age of retirement or leaving the profession (Figure 14), the remaining duration of career as well as estimated year of leaving the profession was able to be calculated (Figure 15). Data collected from the 2021 survey suggests the perfusion workforce will lose 35.1% of current CCPs by 2031. Based on a current matriculation rate of approximately 200 perfusion students per year, over the next 10 years that contribution of 2000 potential CCPs would outweigh the projected loss of approximately 1650 current CCPs over the next decade.[9] When isolating the estimated retirement data from Figure 15 into the next five-year period (2021-

2026), there is a projected loss of 960 CCPs with an addition of 1000 CCPs at current perfusion program matriculation rates.

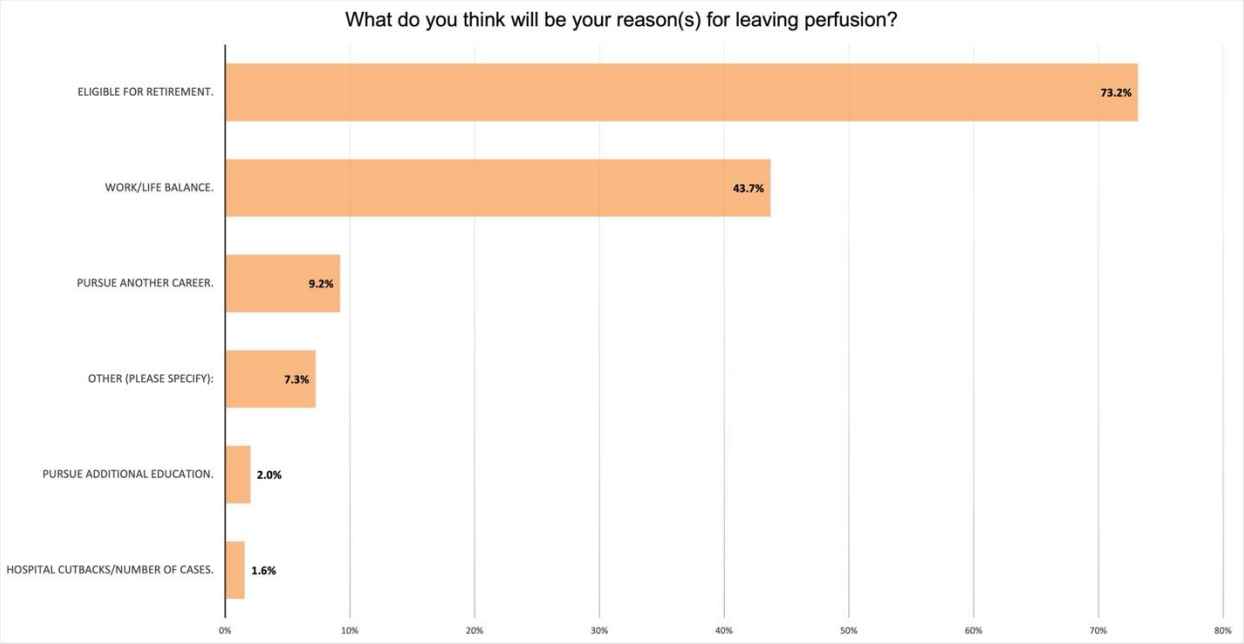


Figure 16: Reason for Leaving Perfusion Profession.

A total of 2,657 CCPs submitted anticipated number of years before retirement.

What do you think will be your reason(s) for leaving perfusion? (Select all that apply.)	Responses	
Eligible for retirement.	73.2%	1945
Work/life balance.	43.7%	1162
Pursue another career.	9.2%	245
Other (please specify):	7.3%	193
Pursue additional education.	2.0%	54
Hospital cutbacks/number of cases.	1.6%	42

Table 15: Reason for leaving perfusion profession.

Reason(s) for Leaving the Perfusion Profession

As a follow up to timing of anticipated retirement, the 2020-2021 survey offered six choices as to why CCPs thought they may leave the perfusion workforce (Figure 16 and Table 15), and the query was completed by 98.1% (n=2,657) of survey respondents. The question allowed for respondents to select all choices that were applicable. Eligibility for retirement was selected by 73.2% of CCPs, followed by 43.7% indicating work/life balance would be a contributory reason for leaving perfusion. Having a positive impression of work/life balance has been identified as a valuable retention tool in Colligan's 2019 publication: Survey on Perceptions of Vacancy and Turnover among Perfusionists[8]. Nearly 10% (9.2%) of respondents to this question within the ABCP survey chose "Pursue another career".

COVID-19

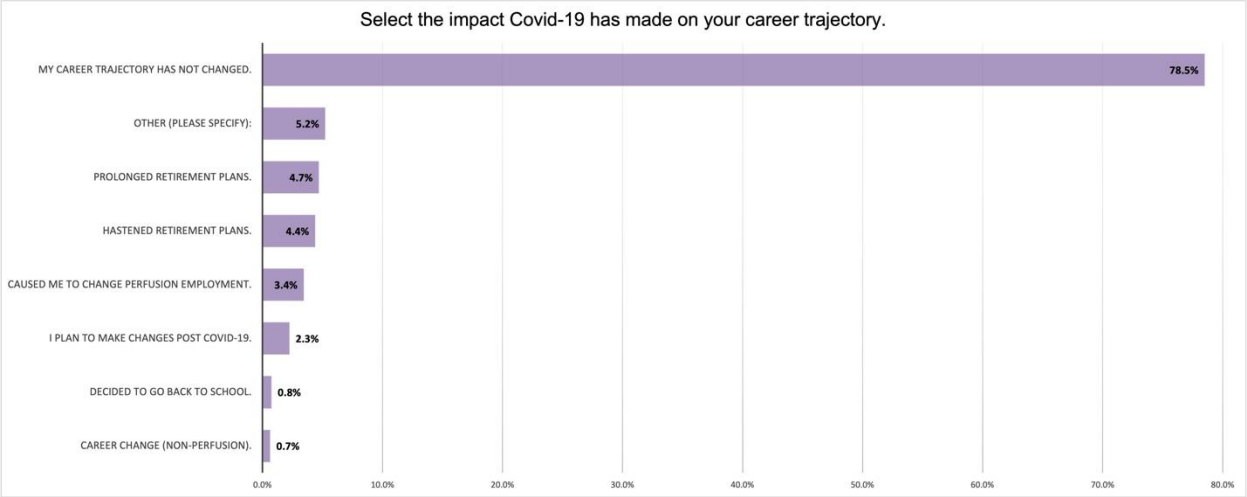


Figure 17: COVID-19 and Career Trajectory.

A total of 2,611 CCPs indicated the potential impact of COVID-19 on their career trajectory.

Select the impact Covid-19 has made on your career trajectory.	Responses	
Career change (non-perfusion).	0.7%	17
Decided to go back to school.	0.8%	20
I plan to make changes post Covid-19.	2.3%	59
Caused me to change perfusion employment.	3.4%	90
Hastened retirement plans.	4.4%	115
Prolonged retirement plans.	4.7%	123
Other (please specify):	5.2%	137
My career trajectory has not changed.	78.5%	2050

Table 16: Covid-19 and Career Trajectory

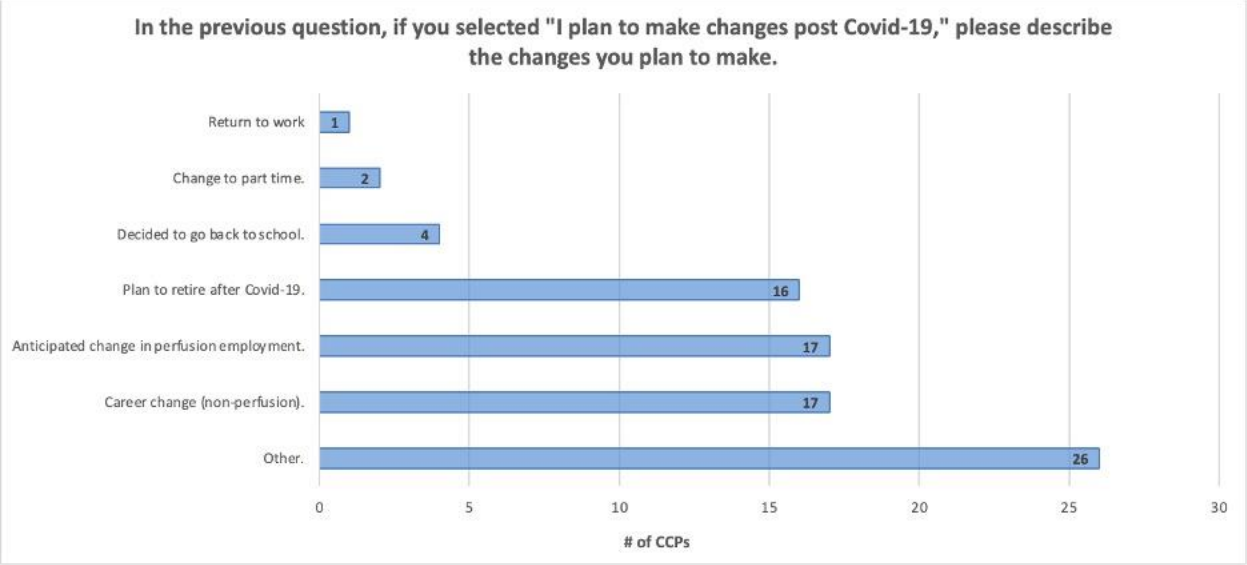


Figure 18: Post COVID-19 Plans

COVID-19 Impact on Career

While the long-term workforce impact of COVID-19 will not be fully recognized for years to come,[16] the ABCP was interested in assessing whether there were any potential short-term consequences within the perfusion profession (Figure 17 and Table 16). Of the survey respondents, 96.4% provided insight on how COVID-19 had thus far influenced their career plans. The majority (78.5%) of respondents indicated that their career trajectory had not changed. Representing a sharp contrast, 4.8% of CCPs (n=123) reported COVID-19 delayed their plans to retire while a similar number (4.4%, n=115) answered that their retirement plans were hastened by the pandemic. Perfusion employment had already changed due to COVID-19 for 3.4% of respondents.

The final question of the 2021 survey was designed to address the COVID question regarding career changes "post-COVID-19", and the vast majority of CCPs either failed to respond (n=704) or indicated a non-response (n=1901). In the follow-up to anticipated plans following the COVID-19 pandemic (Figure 17 and Table 16), CCPs supplied comments regarding future career changes. Qualitative commentary was grouped and portrayed in Figure 18. Those included in the "Other" category represent commentary that did not indicate a specific plan There were some CCPs who did elaborate on how their career path may change due to the pandemic (Figure 18). 83 of them (4.2%) offered comments ranging from an early departure from perfusion to a delayed retirement, pursuit of higher education, change of employer and geographic location, and many sentiments on the topic of financial stability in the time of a pandemic.

LIMITATIONS

The ABCP Survey and the discussion points above do have limitations. The survey was completely voluntary, and while the response rate was strong, care should be taken when applying this data to the entire profession. This survey was meant to provide insight on many intangible aspects of the perfusion workforce, which the specific survey questions reflect. To glean this type of data requires a survey to query many subjective areas and opinions, limiting the ability to apply absolute conclusions or identify steadfast trends within the workforce.

SUMMARY

Through the recertification process, the ABCP has the unique ability to collect information on perfusion demographics, workforce trends and clinical routines. With this ability to query all CCPs, the ABCP may be able to better estimate the needs of the profession and communicate this information to the perfusion community. The ABCP created the 2021 Survey with the intention that annual surveys of the CCP population will be a recurring project, setting up opportunities for future investigation within many of the question sets presented. Continued inquiries as to what type of primary employment a CCP holds will be important to identify trends versus outliers, particularly considering the COVID-19 landscape. Another key area to keep an eye on would be the professional role(s) that CCPs hold. A large amount of CCPs participated in multiple responsibilities in addition to full-time perfusionist. Questions remain regarding

sustainability and/or whether this is included in their job description, additional employment, or out of necessity to stay certified, and may need additional investigation.

Types of procedures performed during recertification cycles should remain a constant query for future studies in order to identify trends in procedure utilization and case variability. Enhancements in technology and shifts in manpower may inevitably alter the professional landscape and job description for CCPs in the future. Along that same line, future survey questions investigating career fulfillment would allow for elaboration on career choice satisfaction, contentment, and longevity.

It is important to emphasize that 2021 survey respondents were answering anticipatory pandemic related questions without the scientific and healthcare communities having full knowledge of the breadth and longevity of the pandemic. Future surveys will be designed to identify if anticipated career trajectories or alterations did in fact come to fruition.

The ABCP is committed to partnering with the perfusion community in developing future survey questions and gratefully appreciates their participation. Documenting the perfusion environment through surveys strengthens the certification process and provides valid information to guide the perfusion workforce.

DECLARATION OF CONFLICSTS OF INTEREST

The Author(s) declare(s) that there are no conflicts of interest

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