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Perceptions and Early Outcomes of the Acuity Circles Allocation Policy Among Liver Transplant Centers in the United States

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Background. Recently, a new liver allocation policy called the acuity circles (AC) framework was implemented to decrease geographic disparities in transplant metrics across donor service areas. Early analyses have examined the changes in outcomes because of the AC policy. However, perceptions among transplant surgeons and staff regarding the new policy remain unknown. **Methods.** A 28-item survey was sent to division chiefs and surgical directors of liver transplantation across the United States. Questions assessed the respondents' perceptions regarding center-level metrics and staff satisfaction. We used Organ Procurement and Transplantation Network data to study differences in allocation between the pre-AC implementation period (2019) and the post-AC implementation period (2020–2021). **Results.** A total of 40 participants completed this ongoing survey study. Most responses were from region 8 (13%), region 10 (15%), and region 11 (13%). Sixty-three percent of respondents stated that the wait time for a suitable offer for recipients with model of end-stage liver disease score <30 has decreased, whereas 50% stated that wait time for a suitable offer for recipients with model of end-stage liver disease score >30 has increased. However, most respondents (75%) felt that the average cost per transplant had increased and that the rate of surgical complications and 1-y graft survival had remained the same. In most states, an observable decrease in in-state liver transplantations occurred each year between 2019 and 2021. In addition, most allocation regions reported an increase in donations after circulatory deaths between 2019 and 2021. **Conclusions.** Perceptions of the new AC policy among liver transplant surgeons in the United States remain mixed, highlighting the potential strengths and concerns regarding its future impact. Further studies should assess the effects of the AC policy on clinical outcomes and liver transplantation access.

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INTRODUCTION

On February 4, 2020, the Organ Procurement and Transplantation Network (OPTN)/United Network for Organ Sharing changed the allocation policy for liver and intestinal transplant organs in the United States.[1-3] This new policy is known as the acuity circles (AC) policy. The purpose of the shift was to reduce geographic disparities in waitlist mortality and the median model of end-stage liver disease (MELD) score at transplant observed under the previous allocation system using donor service areas, which were regional entities designed initially for administrative, rather than clinical allocation, purposes.[3]

The AC policy introduced 2 major changes in an attempt to combat geographic variability in transplant metrics. First, it narrowed the bands of disease severity in which potential transplant patients were grouped for consideration of allocation.

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Second, the AC policy replaced donor service areas with a new allocation system that uses expanding concentric circles centered around the donor hospital to identify appropriate candidates within a region. For most donation after brain death donors, the AC policy states that the offer should be made to candidates falling in the highest disease severity group within 150 nautical miles (NM) surrounding the donor hospital.[2] If the organ is not accepted, the offer is made to candidates in the same disease severity group, but the radius is expanded from 150 to 250 NM from the donor hospital. If the organ is still not accepted, the AC policy offers the organ to patients in the same severity group who are located between 250 and 500 NM from the donor hospital. If the organ is not accepted after this step, then the process is restarted for candidates in the second-highest disease severity group and so on. In this way, the AC policy prioritizes the disease severity of recipients rather than geographic proximity for the allocation of donation after brain death organs.[4]

Research on the impact of ACs on liver transplant centers is an area of active research. The impact of policy change on the allocation of solid organs is not well defined. From the perspective of transplant centers, another growing concern surrounding the new AC policy is increased cost and allocation of resources, with some studies finding an increase in cost and distance traveled between transplant and donor hospitals.[5–9] Knowledge about the satisfaction levels and perceptions among transplant surgery staff in the United States is lacking. Further delineation of geographic disparities in transplant metrics and the perceived impact of the AC among transplant surgeons is needed to better understand the strengths of the AC policy and to identify areas of improvement for future policy decision-making. The aim of our study is 2-fold: (1) to assess the perceived impact of the AC policy among transplant surgeons in the United States and (2) to make comparisons in regional transplant metrics before and after the AC policy implementation.

MATERIALS AND METHODS

Perceptions Among Transplant Surgery Staff

A 28-item survey was created to assess the perceived impact of the AC policy in liver transplant centers across the United States. Survey questions were developed de novo because no previous instrument regarding perceptions of the AC policy has been developed, and questions were validated through expert consensus among a small sample of transplant surgeons in various institutions throughout the United States. Liver transplant centers for the survey were identified using the Scientific Registry of Transplant Recipients and OPTN databases. The Health Resources and Services Administration, US Department of Health and Human Services, provides oversight of the activities of the OPTN and Scientific Registry of Transplant Recipients contractors. The survey was distributed to liver transplant surgical directors or division chiefs of transplant surgery using the Qualtrics platform. We recorded 1 response per program, and the response of the individual was taken as the response of a program. The survey was sent in February 2022. Reminder emails to encourage participation were distributed weekly for 5 wk. The questions asked in the survey can be seen in Table 1.

Respondents were asked to subjectively evaluate whether transplant metrics (eg, number of liver transplants per year, cost per transplant, the number of intraoperative declines), donor characteristics (eg, the number of donations after circulatory deaths [DCDs]), and complication rates had increased, decreased, or remained the same following AC implementation. In addition, a 5-item Likert scale was used to assess perceived overall satisfaction levels with the AC policy among transplant surgery staff at each center. Participants were also

TABLE 1.

Survey questions assessing perceptions among transplant surgery staff

1.	w with
2.	Please indicate your role.
3.	How many years have you been in practice?
4.	Allocation region
5.	Number of liver transplants done by your center per year
6.	Who first receives the organ offer notification in your center?
7.	After implementation of the new allocation policy, the number of liver transplants per year in your center (compared with prior years) has
8.	For recipients with MELD score >30, the wait time for a suitable offer has
9.	For recipients with MELD score <30, the wait time for a suitable offer has
10.	After implementation of the new allocation policy, the median MELD score for transplant recipients has
11.	After implementation of the new allocation policy, the number of donations after circulatory deaths the program receives has
12.	After implementation of the new allocation policy, the number of "open offers" has
13.	After implementation of the new allocation policy, the rate of intraoperative declines has
14.	After implementation of the new allocation policy, the number of liver offers after an intraoperative decline has
15.	After implementation of the new allocation policy, the cold ischemia time has
16.	After implementation of the new allocation policy, the average cost per liver transplant has
17.	After implementation of the new allocation policy, the average travel distance per liver transplant has
18.	Under the new allocation policy, the ratio of local OPO donor livers to imported donor livers received has
19.	After implementation of the new allocation policy, is your program using more extended criteria liver grafts?
20.	After implementation of the new allocation policy, the 1-y graft survival for liver transplants has
21.	After implementation of the new allocation policy, the rate of postsurgical biliary and vascular complications has
22.	How often does your transplant program send its own team or local recovery surgeons to retrieve donor livers outside of your allocation region?
23.	Regarding your answer to Question 22 above, were these practices different before and changed as a result of implementing the new allocation policy?
24.	Please indicate the overall level of satisfaction with the new allocation system among liver transplant faculty and staff members.
25.	Do you feel that implementation of the new allocation has had a positive or negative impact on your liver transplant program?
26.	When the new allocation policy was being created, were you asked to provide input in the policy development process?
27.	Do you have any specific concerns or thoughts regarding the new allocation policy and its potential impact that were not addressed in this survey?
28.	Do you have any feedback or suggestions for how the new allocation system could be improved?

MELD, model of end-stage liver disease; OPO, organ procurement organization.

asked to provide feedback on the advantages and disadvantages of the new AC policy and to rate the overall impact of the AC policy as positive, negative, or too early to be determined.

Changes in Transplant Metrics and Donor Characteristics

Data on center-level transplant metrics and donor characteristics were collected using the OPTN database. The variables of interest included the number of liver transplants per year, number and percentage of deceased donors that were DCDs, percentage of in-state donors, and the percentage of livers coming from donor hospitals within a 500-NM radius (the largest radius designated in an AC) of the recipient transplant center. In-state donors were identified as livers in which the deceased donor and the recipient transplant center were located within the same state. The concentric radius of 500 NM surrounding a recipient hospital was calculated using an online mapping tool (Calcmaps: https://www.calcmaps.com/map-radius) that uses Google Maps distance locators and a radius tool set to 500 miles surrounding the address of each individual transplant center. Given that the AC policy was implemented in February 2020 and the 1-mo period in January was unlikely to drastically impact the trajectory of the findings, the year 2020 was used as the cutoff differentiating the preimplementation period from the postimplementation period. Comparisons were made between the pre-AC implementation period (2019) and the post-AC implementation period (2020–2021). Center-level data were then grouped based on allocation region, based on the OPTN division of the United States into 11 geographic entities to assess potential geographic disparities following AC implementation.

For the qualitative feedback portion of the Qualtrics survey, common themes regarding respondents' concerns and feedback for improving the AC policy were identified based on the frequency of responses discussing a particular topic (with a minimum of 3 respondents discussing a similar theme) and agreeing upon by group discussion and consensus among the researchers. The chi square test was used to investigate changes in the proportion of deceased liver donors that were DCD by year for each allocation region, as well as the number of deceased donor transplants performed each year, using a P value of <0.05 as a threshold for statistical significance.

The study was approved by the institutional review board at Tufts University.

RESULTS

Perceptions Survey

A total of 40 division chiefs and surgical directors of liver transplantation responded to the survey, yielding a response rate of 47% based on the 85 programs who confirmed receipt of the survey. All of the 11 OPTN allocation regions were represented, with the majority of respondents being from region 8 (13%), region 10 (15%), and region 11 (13%). Allocation region 6 had the least number of respondents (n = 1), and 2 respondents did not wish to disclose their institutional and geographic affiliations (Table 2).

Thirty-seven percent of the respondents stated that the number of liver transplants per year in their center has increased, whereas 33% stated that it has remained the same. Sixty-three percent stated that wait time for a suitable offer for recipients with MELD score <30 has decreased, whereas 50% stated that wait time for a suitable offer for recipients with MELD score >30 has increased. Sixty-three percent stated that the number of DCDs the program receives has increased. In terms of suboptimal donor characteristics, most participants (53%) had felt that the use of extended criteria liver grafts had increased. The greatest amount of consensus was regarding a perceived overall increase in average cost (75% consensus) and average distance traveled (73% consensus) per

TABLE 2.

Responses per region

Regions	Total number of liver transplant centers contacted in each region	Responses, n (% of overall responses)
Region 1	5	3 (3.5)
Region 2	11	4 (4.7)
Region 3	10	3 (3.5)
Region 4	11	3 (3.5)
Region 5	9	7 (8.2)
Region 6	5	1 (1.1)
Region 7	5	3 (3.5)
Region 8	6	4 (4.7)
Region 9	8	3 (3.5)
Region 10	7	6 (7.0)
Region 11	8	3 (3.5)

TABLE 3.

Perceptions of respondents (n = 40) on the impact of AC allocation policy

Compared with prior years before AC implementation	Increased	Decreased	Remained the same
The number of liver transplants per year in your center has	37.0%	30.0%	33.0%
The wait time for a suitable offer for recipients with MELD score <30 has	10.0%	63.0%	27.0%
The wait time for a suitable offer for recipients with MELD score >30 has	50.0%	17.0%	33.0%
The median MELD score for transplant recipients has	53.0%	12.0%	35.0%
The number of donations after circulatory deaths the program receives has	63.0%	10.0%	27.0%
The number of open offers has	37.0%	23.0%	40.0%
The rate of intraoperative decline has	37.0%	18.0%	45.0%
The cold ischemia has	47.0%	0%	53.0%
The average cost per liver transplant has	75.0%	0%	25.0%
The average travel distance per liver transplant has	73.0%	7.0%	20.0%
The ratio of local OPO donor livers to imported donor livers received has	12.0%	73.0%	15.0%
The 1-y graft survival for liver transplants has	10.0%	28.0%	62.0%
The rate of postsurgical biliary and vascular complications has	23.0%	7.0%	70.0%
The use of more extended liver graft criteria has	53.0%	10.0%	37.0%
	Positive	**Negative**	**Too early to tell**
Do you feel that implementation of the new allocation has had a positive or negative impact on your liver transplant program?	33.0%	44.0%	23.0%

AC, acuity circles; MELD, model of end-stage liver disease; OPO, organ procurement organization.

TABLE 4.

Breakdown of survey responses by regions

	Regions										
Responses	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
The number of liver transplants per year in your center has											
Increased	2 (66.66%)	1 (25%)	–	1 (33.33%)	4 (57.1%)		1 (33.33%)	1 (25%)	3 (100%)	2 (33.33%)	–
Decreased	–	1 (25%)	2 (66.6%)	2 (66.66%)	2 (28.5%)	–	1 (33.33%)	2 (50%)	–	–	2 (66.66%)
Remained the same	1 (33.3%)	2 (50%)	1 (33.3%)	–	1 (14.2%)	1 (100%)	1 (33.33%)	1 (25%)	–	4 (66.66%)	1 (33.33%)
The wait time for a suitable offer for recipients with MELD scores <30 has											
Increased	1 (33.33%)	3 (75%)	2 (66.66%)	1 (50%)	3 (42.85%)	–	2 (66.66%)	2 (50%)	–	3 (50%)	3 (100%)
Decreased	1 (33.33%)	–	–	No response (0%)	2 (28.57%)	–	1 (33.33%)	1 (25%)	–	2 (33.33%)	–
Remained the same	1 (33.33%)	1 (25%)	1 (33.33%)	1 (50%)	2 (28.57%)	–	–	1 (25%)	3 (100%)	1 (16.66%)	–
The wait time for a suitable offer for recipients with MELD score >30 has											
Increased	1 (33.33%)	–	–	1 (33.33%)	0 (0%)	–	–	1 (25%)	–	–	–
Decreased	2 (66.66%)	3 (75%)	–	1 (33.33%)	6 (85.71%)	–	3 (100%)	2 (50%)	3 (100%)	3 (50%)	3 (100%)
Remained the same	–	1 (25%)	3 (100%)	1 (33.33%)	1 (14.2%)	–	–	1 (25%)	–	3 (50%)	–
The median MELD score for transplant recipients has											
Increased	1 (33.33%)	3 (75%)	2 (66.66%)	2 (66.66%)	3 (42.85%)	–	–	1 (25%)	1 (33.33%)	6 (100%)	2 (66.66%)
Decreased	1 (33.33%)	–	–	1 (33.33%)	1 (14.28%)	–	1 (33.33%)	–	1 (33.33%)	–	(0%)
Remained the same	1 (33.33%)	1 (25%)	1 (33.33%)	–	3 (42.85%)	1 (100%)	2 (66.66%)	3 (75%)	1 (33.33%)	–	1 (33.33%)
The number of donations after circulatory deaths the program receives has											
Increased	2 (66.66%)	3 (75%)	1 (33.33%)	2 (66.66%)	4 (57.14%)	–	2 (66.66%)	3 (75%)	1 (33.33%)	6 (100%)	1 (33.33%)
Decreased	1 (33.33%)	–	–	–	–	–	1 (33.33%)	1 (25%)	–	–	–
Remained the same	–	1 (25%)	2 (66.66%)	1 (33.33%)	3 (42.85%)	1 (100%)	–	–	2 (66.66%)	–	2 (66.66%)
The number of open offers has											
Increased	1 (33.33%)	3 (75%)	–	2 (66.66%)	4 (57.14%)	–	1 (33.33%)	1 (25%)	–	3 (50%)	–
Decreased	2 (66.66%)	1 (25%)	2 (66.66%)	–	1 (14.28%)	–	–	1 (25%)	1 (33.33%)	–	1 (33.33%)
Remained the same	–	–	1 (33.33%)	1 (33.33%)	2 (28.57%)	1 (100%)	2 (66.66%)	2 (50%)	2 (66.66%)	3 (50%)	2 (66.66%)
The rate of intraoperative decline has											
Increased	–	3 (75%)	–	1 (33.33%)	No response	–	1 (33.33%)	3 (75%)	2 (66.66%)	4 (66.66%)	1 (33.33%)
Decreased	1 (33.33%)	1 (25%)	1 (33.33%)	1 (33.33%)	2 (33.33%)	0 (0%)	1 (33.33%)	–	–	–	–
Remained the same	2 (66.66%)	–	2 (66.66%)	1 (33.33%)	4 (66.66%)	1 (100%)	1 (33.33%)	1 (25%)	1 (33.33%)	2 (33.33%)	2 (66.66%)
The cold ischemia has											
Increased	1 (33.33%)	3 (75%)	2 (66.66%)	1 (33.33%)	2 (28.57%)	–	1 (33.33%)	3 (75%)	–	4 (66.66%)	2 (66.66%)
Decreased	–	–	–	–	–	–	–	–	–	–	–
Remained the same	2 (66.66%)	1 (25%)	1 (33.33%)	2 (66.66%)	5 (71.42%)	1 (100%)	2 (66.66%)	1 (25%)	3 (100%)	2 (33.33%)	1 (33.33%)
The average cost per liver transplant has											
Increased	2 (66.66%)	4 (100%)	2 (66.66%)	3 (100%)	4 (57.14%)	–	2 (66.66%)	3 (75%)	2 (66.66%)	6 (100%)	2 (66.66%)
Decreased	–	–	–	–	–	–	–	–	–	–	–
Remained the same	1 (33.33%)	–	1 (33.33%)	–	3 (42.85%)	1 (100%)	1 (33.33%)	1 (25%)	1 (33.33%)	–	1 (33.33%)
The average travel distance per liver transplant has											
Increased	3 (100%)	4 (100%)	2 (66.66%)	2 (66.66%)	3 (42.85%)	–	2 (66.66%)	2 (50%)	1 (33.33%)	6 (100%)	1 (33.33%)
Decreased	–	–	–	–	3 (42.85%)	–	1 (33.33%)	–	–	–	1 (33.33%)
Remained the same	–	–	1 (33.33%)	1 (33.33%)	1 (14.28%)	1 (100%)	–	2 (50%)	2 (66.66%)	–	1 (33.33%)
The ratio of local OPO donor livers to imported donor livers received has											
Increased	–	–	–	–	1 (14.28%)	–	1 (33.33%)	1 (25%)	1 (33.33%)	–	2 (66.66%)
Decreased	3 (100%)	4 (100%)	2 (66.66%)	2 (66.66%)	4 (57.14%)	–	2 (66.66%)	3 (75%)	1 (33.33%)	6 (100%)	1 (33.33%)
Remained the same	–	–	1 (33.33%)	1 (33.33%)	2 (28.57%)	1 (100%)	–	–	1 (33.33%)	–	–
The 1-y graft survival for liver transplants has											
Increased	2 (66.66%)	–	–	–	–	–	–	–	–	–	1 (33.33%)
Decreased	–	1 (25%)	–	1 (50%)	3 (42.85%)	–	2 (66.66%)	2 (50%)	–	2 (33.33%)	–
Remained the same	1 (33.33%)	3 (75%)	3 (100%)	1 (50%)	4 (57.14%)	1 (100%)	1 (33.33%)	2 (50%)	3 (100%)	4 (66.66%)	2 (66.66%)
The use of more extended liver graft criteria has											
Increased	1 (33.33%)	2 (50%)	1 (33.33%)	3 (100%)	2 (28.57%)	–	2 (66.66%)	4 (100%)	1 (33.33%)	5 (83.33%)	–
Decreased	1 (33.33%)	1 (25%)	1 (33.33%)	–	–	–	–	–	1 (33.33%)	–	–
Remained the same	1 (33.33%)	1 (25%)	1 (33.33%)	–	5 (71.42%)	1 (100%)	1 (33.33%)	–	1 (33.33%)	1 (16.66%)	3 (100%)
Do you feel that implementation of the new allocation has had a positive or negative impact on your liver transplant program?											
Positive	3 (100%)	–	–	1 (33.33%)	3 (42.85%)	1 (100%)	No response	–	2 (66.66%)	2 (33.33%)	1 (33.33%)
Negative	–	3 (75%)	2 (66.66%)	1 (33.33%)	3 (42.85%	–	1 (100%)	2 (50%)	–	3 (50%)	1 (33.33%)
Too early to tell	–	1 (25%)	1 (33.33%)	1 (33.33%)	1 (14.28%)	–	No response	2 (50%)	1 (33.33%)	1 (16.66%)	1 (33.33%)

MELD, model of end-stage liver disease; OPO, organ procurement organization.

liver transplant following policy implementation, as well as a decrease in the ratio of donor livers from local organ procurement organizations (OPOs) to imported donor livers. A total of 14 respondents (35%) reported that their institution made policy changes to how donor livers are retrieved outside of the center's allocation region following AC implementation. In terms of the overall impact of the new allocation system on their individual program, 44% felt it had had a negative impact, whereas 23% felt it was too early to tell (Table 3). Responses from different regions are highlighted in Table 4.

Analysis of the respondents' free-text feedback regarding the AC policy found 3 common themes: (1) concerns regarding the disadvantages placed on patients with hepatocellular carcinoma as a result of the new policy, (2) suggestions for better prioritization of local donors, and (3) concerns regarding increased cost per liver transplant following AC implementation (Table 5).

Organ Procurement and Transplantation Network Metrics Pre- and Post-AC Implementation

Data on deceased donor liver transplants in which the donor and recipient center were located within the same state were available for 39 of the 50 states using the OPTN center-level database. Figure 1 depicts the percentage of deceased liver transplants that were in-state over a 3-y time period, from 2019 to 2021. In most states, an observable decrease in in-state liver transplantations occurred each year between 2019 (pre-AC implementation) and 2021 (1 y after AC policy implementation).

Similarly, when examining the changes in the average percent of deceased donor livers received by transplant centers within an allocation region that came from a donor center >500 NM away, more allocation regions saw an overall increase in deceased donor livers retrieved from further away between 2019 and 2021 (Figure 2A). Only 3 of the 11 allocation regions—regions 3, 5, and 9—had a decrease in the average percent of deceased donor livers retrieved from >500 NM away from the transplant centers in that region (Figure 2B). Taken together, these changes mirror the reported perceptions of study survey respondents regarding the overall decrease in the ratio of local OPOs to imported livers and the potential need for more local liver prioritization.

Yearly changes to the proportion of deceased liver donations that were DCDs also reflected the perceptions of the division chiefs and surgical directors surveyed because 8 of

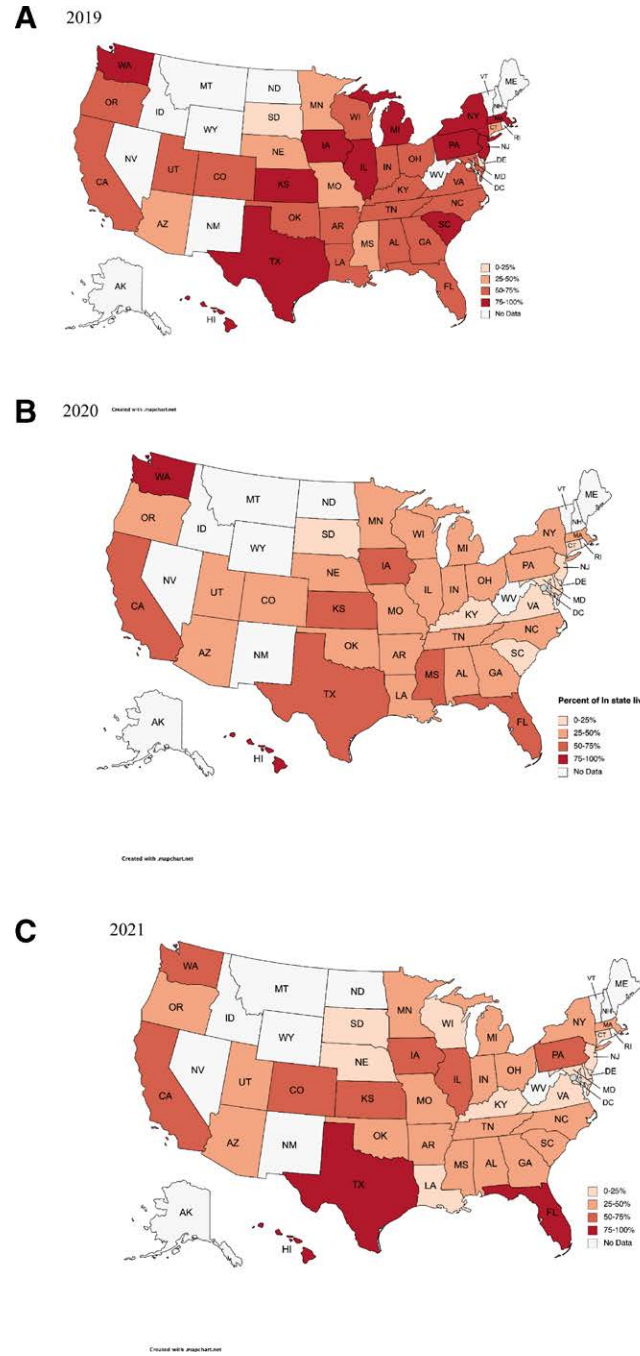

FIGURE 1. Percentage of in-state liver transplants across the United States from 2019 to 2021. A, 2019. B, 2020. C, 2021.

TABLE 5.

Qualitative feedback from survey respondents regarding AC policy

Common theme: Improved consideration of HCC patients needed

- "I think the new system has disadvantaged patients with HCC."
- "HCC exemption points disparity became a problem."
- "Cancer patients wait too long."
- "HCC transplants more difficult."
- "HCC MELD exception should at least be mMAT, not mMAT-3."
- "More points for cancer."

Common theme: Local prioritization

- "Increase local priority, decrease travel, increase efficiency and regulate OPOs."
- "The circles should be based upon population density or stated in another way, should define a particular sized population rather than distance."
- "Have a point system similar to kidneys that incorporates not only MELD, but also distance, disease, time on list, etc."
- "Higher priority for placing livers local first."
- "Centers away from east/west coast or national border have more chances to be included ACs. Such imbalance should be corrected."

Common theme: Concerns regarding cost

- "(The AC policy) completely underestimated cost increase and logistics."
- "Logistics, costs, and off-hours liver transplants (unsafe) have increased dramatically."
- "Cost of planes (increased), availability of planes, efficiency is down, length of declaration to donor is up."
- "The cost of transplant is so high."

AC, acuity circles; HCC, hepatocellular carcinoma; MELD, model of end-stage liver disease; OPO, organ procurement organization; mMAT, median MELD at transplant; mMAT-3, median MELD at transplant within the donor service area minus 3 points.

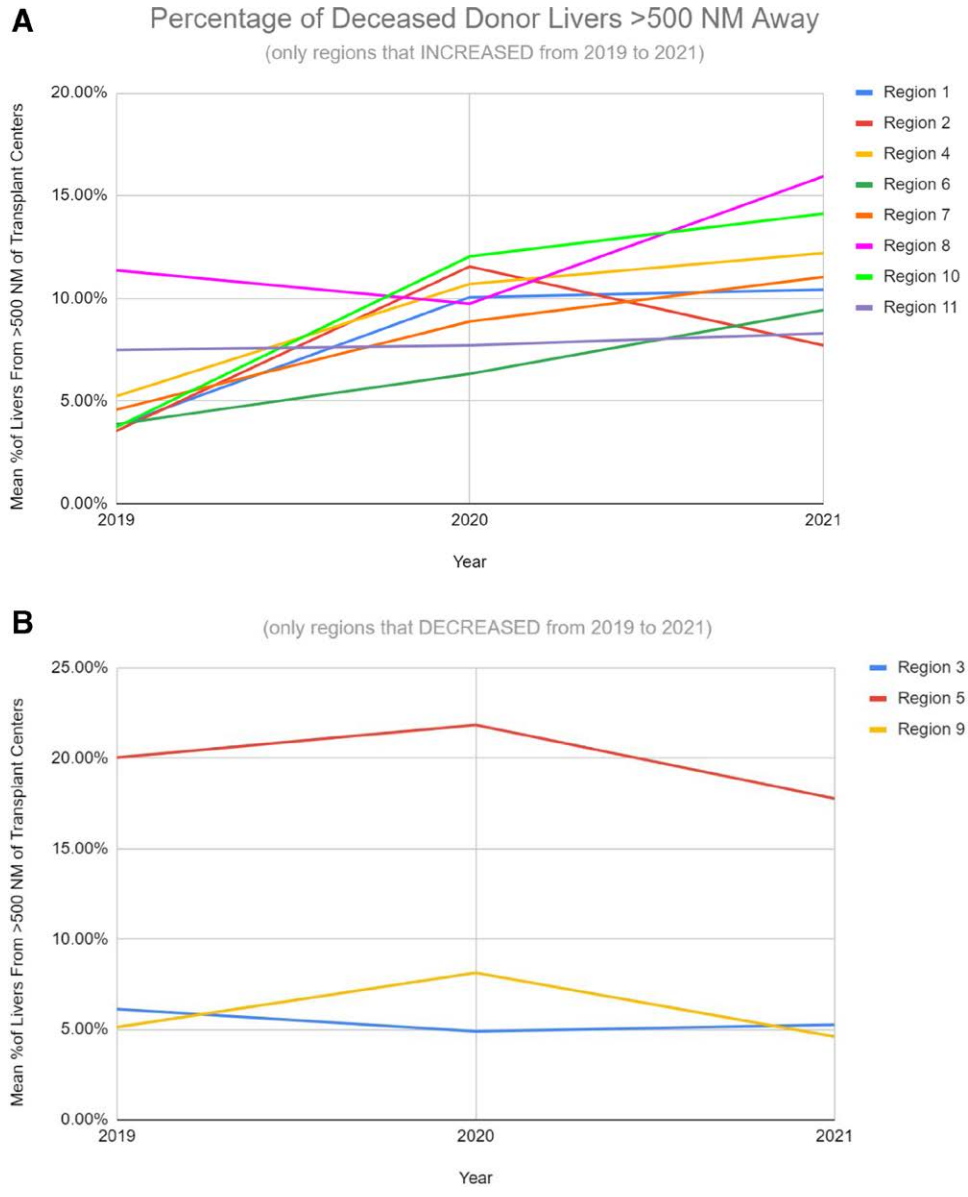

FIGURE 2. Average percent of deceased donor livers from >500 NM of transplant centers. A, Regions with an incline. B, Regions with a decline. NM, nautical miles.

the 11 allocation regions reported an increase in DCDs between 2019 and 2021, according to the OPTN database (Figure 3). Four of the allocation regions experienced a statistically significant change in the proportion of DCDs between 2019 and 2021. In terms of the total number of deceased donor livers that were transplanted within allocation regions for each year, the majority of regions did not see a notable change in the total number of deceased donor livers (Figure 4). Comparing the proportion of deceased donor liver transplants performed each year, region 9 was the only region that saw a statistically significant increase in deceased donor liver transplants between 2019 and 2021 ($P < 0.001$). The remaining regions did not see a statistically significant change in this metric.

DISCUSSION

Our study finds that most respondents felt that the median MELD at transplant at their center had increased and that the wait time for patients with MELD score >30 had decreased (53% and 50%, respectively), suggesting that the AC policy appeared to have achieved its intended goal of increased disease severity prioritization. However, this change resulted in a corresponding increase in the waiting time for suitable offers experienced by patients with MELD score <30 (63% consensus among respondents).[10]

As part of the trade-off for prioritizing patient disease severity over geographic proximity, the ratio of local OPO donor livers to imported donor livers and the average distance traveled per transplant were both perceived to have increased among most respondents.[8,11] These changes expectedly correspond to a reported average cost per transplant (75% consensus and zero respondents reporting a perceived decrease in the cost). These findings are consistent with the results from a previously published single-center study performed by Wall et al[8] and suggest that the AC policy may negatively impact transplant center financial viability. Although the increase in cost might be justified by some of the prioritization of patients

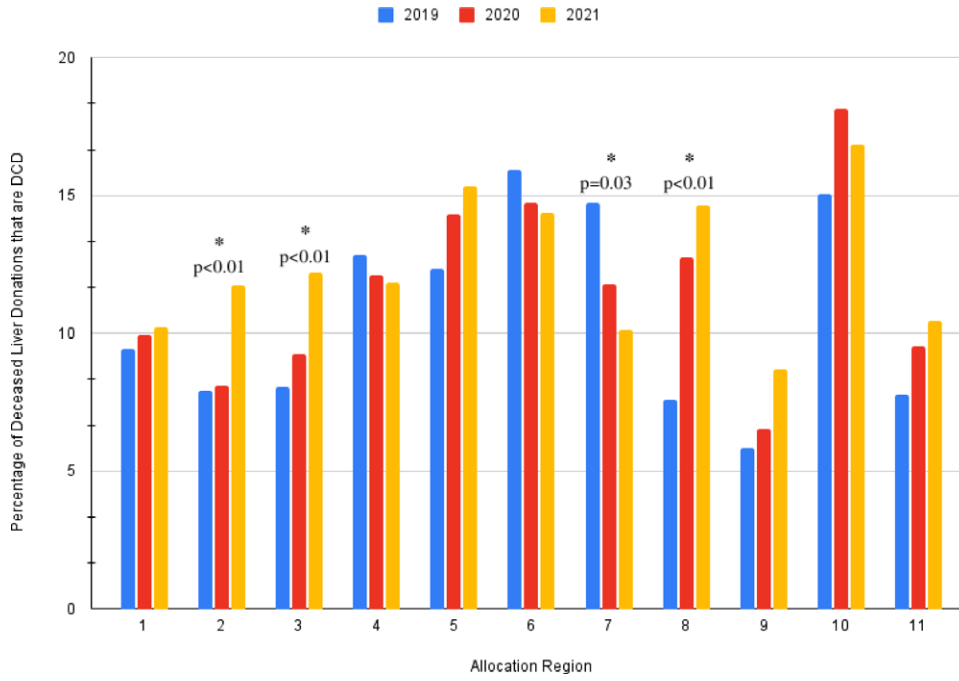

FIGURE 3. Percentage of deceased livers that are DCD by allocation region and year. DCD, donations after circulatory death.

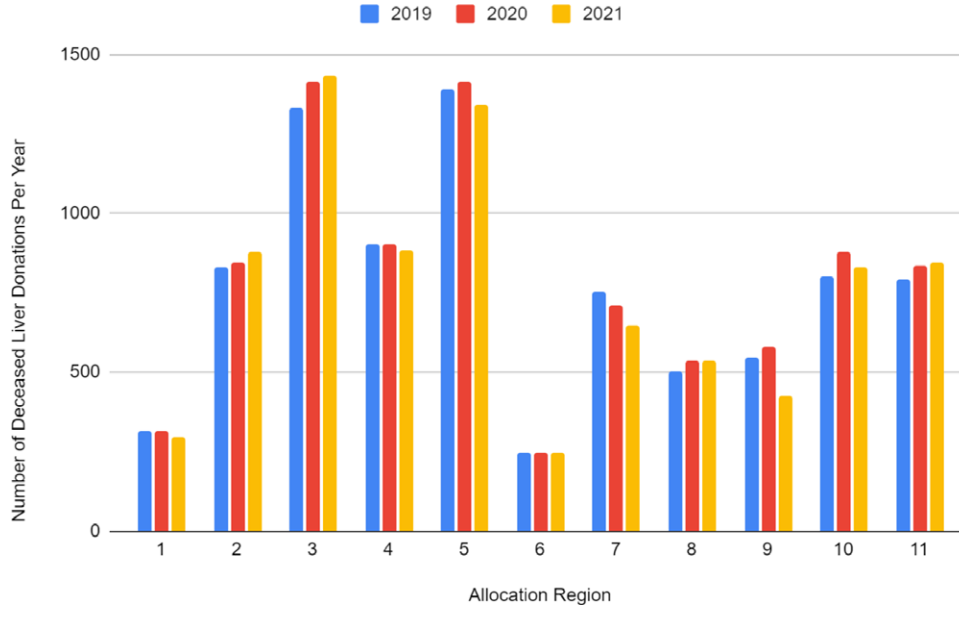

FIGURE 4. Deceased liver donations by allocation region and year.

with higher disease severity leads to improved patient outcomes, the observations uncovered in the survey suggest that not all surgeons perceive these changes as benefiting patients; for example, over half of the respondents felt that the use of practices associated with worse patient outcomes, such as DCD donors (63% of respondents) and extended criteria liver grafts (53% of respondents), had increased. Additionally, despite the increased cost and improved prioritization of patients with MELD score >30, most respondents reported that the rates of postsurgical biliary or vascular complications and 1-y graft survival had remained the same (70% and 63% consensus, respectively). Moreover, a common theme arising from the participant feedback was the concern that the new policy places patients with hepatocellular carcinoma at a disadvantage and may worsen health disparities in this particular patient group.

Even though 65% of the respondents reported being asked for input during the AC policy development process, the reported perceptions of staff satisfaction were evenly split between overall dissatisfaction and overall satisfaction (45% and 38%, respectively). About 44% of survey participants felt that the overall impact of the AC policy was not as positive as intended, and 23% thought it was too soon to tell what the effect would be. These findings highlight the importance of understanding the perceived impact of allocation policy changes among transplant surgeons. Many participate

in providing input and developing policies that affect their practice, staff, and institutional stability. The extent to which transplant surgeons feel that their information is integrated may set the stage for how future feedback and policy development in the field are executed. Additionally, feedback on how allocation policy changes impact daily practice is crucial to uncovering indirect or unintended effects of the new AC policy, such as the decreased exposure to organ procurement faced by surgical trainees that resulted from the increased hiring of recovery teams by OPOs, which might disadvantage the postgraduate training of future transplant surgeons in the United States.[12,13]

Notably, the systematically collected data from the OPTN database mirrored the subjective outcomes following AC implementation that were reported by survey respondents. According to OPTN, most states reported an overall decrease in within-state liver transplants between 2019 and 2021, and more allocation regions (9/11) saw an overall increase in deceased donor livers retrieved from >500 NM. Both of these findings are consistent with the reported increase in average distance traveled per transplant from survey respondents and the call for improved local prioritization found in qualitative feedback in the survey. Although the authors could not directly examine the average cost per transplant by allocation region using the OPTN database, increased travel and utilization of imported (rather than local) liver donations have been shown to correlate with an increase in cost sustained by transplant centers. Consistent with survey responses, 8 of the 11 allocation regions had a notable increase in the proportion of DCDs by 2021 compared with 2019, with 4 of the allocation regions experiencing changes in the percentage of DCDs by year that reached statistical significance. On the survey, respondents were evenly split regarding the perceived changes in liver transplant volume, with approximately one-third reporting an increase, a decrease, or an absence of change in the number of liver transplants per year since AC policy implementation. The number of deceased donor liver transplants per allocation region between 2019 and 2021 reported by OPTN reflects this ambiguity and lack of uniformity in the impact of the AC policy on liver transplant volumes because no remarkable changes were observed with this metric.

This study has several strengths. First, this is the first study to the authors' knowledge that investigates the perceived impact of the new AC policy among transplant surgeons in the United States since the policy's implementation, using survey methodology and systematic surveillance data for comparison. Second, from the individuals who responded to the survey, the study included a diverse sample of chiefs and surgical directors spanning many geographical areas and institutional scales throughout the United States. Finally, the methodology of this study is strengthened by our ability to assess the subjectively reported impact of the AC policy from experts in the field alongside systematically collected data from OPTN to provide objective comparisons and validation. In terms of limitations, first, this study did not include a sensitivity analysis or specific survey questions to assess the influence of the coronavirus disease 2019 (COVID-19) pandemic on the trajectory of the AC policy implementation. The true effect of the new allocation policy will become evident with time, especially once transplant centers have policies regarding COVID-19 vaccination in potential recipients and COVID-19–positive deceased donors. Second, the researchers were also unable to analyze the periodic OPTN data by month, which further limited the ability to delineate the impact of the different phases of the COVID-19 pandemic (which was announced by the World Health Organization in March of 2020, approximately 1 mo after the implementation of the AC policy). Third, although all of the 11 OPTN allocation regions were represented by respondents in the study survey, the response rate is <50%, and the generalizability of the findings may be limited by the more miniature representation from regions with a low response rate. Perceptions among other members of the transplant staff (eg, surgical residents, nursing coordinators, etc) and the longer-term effects of the AC policy beyond the 1-y postimplementation period should be investigated in future studies. Finally, the response rate was low. We emailed the program chairs or liver surgical director directly multiple times via email, separated by 1 wk apart, to get more recruitment. The surveys were sent to the liver directors first; if a response was not recorded, we emailed the transplant division chief. By choosing the division chief or the liver surgical director, we got more of a sense of the whole program rather than an individual. An email was the only way we used to do the survey, so we clearly understood the denominator. Several other contact methodologies, such as mail, social media, or telephone, may have increased the number of responses.

CONCLUSION

Among transplant surgeons across the United States, many have perceived the intended shift toward higher median MELD at transplant and shorter wait times for patients with MELD score >30 following the implementation of the ACs policy. However, respondents in this study have noted trade-offs resulting from these changes, including increases in cost, travel, and practices associated with worsened patient outcomes, such as DCDs. Analysis of data collected from the OPTN database generally supported the changes perceived by transplant surgeons. Continued policy discussions and attention to the current changes and concerns spurred by the new allocation policy among liver transplant surgeons should take place to identify future opportunities for benefiting patients and transplant centers across the United States.

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