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National Early Career Transplant Hepatologist Survey: Compensation, Burnout, and Job Satisfaction

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Despite the growth of transplant hepatology as a subspecialty over the past decade, data on professional roles and compensation models remain lacking. Furthermore, the prevalence of physician burnout and job satisfaction are unknown in this profession. We aimed to conduct a comprehensive assessment of early career transplant hepatologists to fill these voids in knowledge and to inform current and future transplant hepatologists. An online survey designed to quantify clinical and nonclinical roles, compensation and structure, job satisfaction, and burnout was sent to 256 early career transplant hepatologists. Respondents were divided into three practice settings: university hospital clinical (n = 79), non-university hospital clinical (n = 35), and research (n = 25). The median age of respondents was 38 (interquartile range [IQR] 36–40) years, and 44% were women. The median half-days/week spent in clinic was 4 (IQR 3–6) and in endoscopy was 1 (IQR 1–2). Most of the respondents provided inpatient care (88%) for a median of 9 (IQR 6.5–10) weeks/year. The median base compensation was \$300,000 (IQR US \$263,750–\$326,250), and most (76%) had salary-based compensation. Although only 8% of respondents were dissatisfied with their position, the prevalence of burnout was high at 35%. *Conclusion:* This survey is a comprehensive assessment focusing on early career transplant hepatologists, is reflective of the current training paradigm and practice of transplant hepatology, and provides transparency to guide professional negotiations and empower both trainees pursuing careers in transplant hepatology and early career transplant hepatologists. (*Hepatology Communications* 2021;5:701–712).

Since the introduction of the American Board of Internal Medicine (ABIM) certification exam in 2006, followed by Accreditation Council for Graduate Medical Education (ACGME)-accredited advanced training programs in 2007, the practice of transplant hepatology has evolved into a mature subspecialty within gastroenterology. Over the past decade, the number of active ABIM-certified transplant

hepatologists has increased from 197 in 2006 to 629 in 2018, the latter representing 4% of ABIM-certified gastroenterologists in 2018.⁽¹⁾ This has paralleled the growth of ACGME-accredited transplant hepatology fellowship programs from 20 in 2007–2008 to 54 in 2019–2020.⁽²⁾ Despite this rapid growth, data on professional roles and compensation models of transplant hepatologists remain lacking. Available data often lack

Abbreviations: ABIM, American Board of Internal Medicine; AST, American Society of Transplantation; CI, confidence interval; EHR, electronic health record; FTE, full-time equivalent; IQR, interquartile range; LICOP, Liver and Intestinal Community of Practice; MBI, Maslach Burnout Inventory; MBI-EE, Maslach Burnout Inventory–Emotional Exhaustion; OR, odds ratio; RVU, relative value unit; Tx, transplant; UH, university-affiliated hospital; URL, uniform resource locator; wRVU, work relative value unit.

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specificity for transplant hepatology and are reliant on traditional productivity metrics, limiting applicability to the subspecialty and failing to capture the full spectrum of clinical and nonclinical contributions of transplant hepatologists.⁽³⁻⁸⁾

In addition to uncertainty regarding compensation, another major issue facing new and junior physicians is burnout. Although rates of burnout among transplant physicians or surgeons have been rising, data on physician burnout specifically in practicing transplant hepatologists are not available.^(9,10) Beyond its impact on well-being, physician burnout has been associated with patient safety issues, adverse clinical outcomes, and both physician turnover and intention to quit.^(11,12) Given the predicted shortage of hepatology-trained physicians over the next decade, it is critical to quantify the prevalence and predictors of burnout to ensure both the well-being of physicians and patients, and in particular, to promote retention of current transplant hepatologists.⁽¹³⁻¹⁵⁾

To address gaps in granular data on clinical and nonclinical roles, compensation, burnout, and job satisfaction level among early career transplant hepatologists, we conducted a national survey of early career transplant hepatologists. The aims of this survey were to (1) define clinical and nonclinical roles of transplant hepatologists, (2) describe compensation structure and amount, and (3) quantify the prevalence and predictors of physician burnout and job satisfaction. In so doing, we aim to provide a much-needed resource for our community of transplant hepatologists. This manuscript is a work product of the American Society of Transplantation's (AST) Liver and Intestine Community of Practice.

Methods

CONSTRUCTION OF SURVEY

A 61-question survey to comprehensively define the individual demographics, institutional characteristics, clinical and nonclinical roles, and compensation structure of early career transplant hepatologists was developed (Supporting Information). The survey was designed by study authors with serial review by transplant physician members of the AST's Liver and Intestine Community of Practice (LICOP) Education Subcommittee, LICOP Executive Committee, and AST Education Committee for appropriateness of content. Study data were collected and managed using Research Electronic Data Capture hosted at the University of Colorado.⁽¹⁶⁾

Because clinical and nonclinical roles vary over time, questions were designed to quantify half-days of clinical activity per week (for outpatient activities including clinic and endoscopy), weeks per year of inpatient service (including overnight/weekend call), and half-days of nonclinical activities per week. In addition, respondents were asked about their work relative value unit (wRVU) productivity.

The single-item question used to screen for burnout was validated against the Maslach Burnout Inventory–Emotional Exhaustion (MBI-EE) single-item questionnaire.⁽¹⁷⁾ MBI-EE is one of three components of the MBI, and the single-item MBI-EE was validated against the full MBI-EE and used in national physician surveys.^(18,19) For job satisfaction, in addition to Likert-style assessment of overall job satisfaction, change in satisfaction, and contributors to satisfaction,

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we included 19 individual questions from the RAND Physician Satisfaction survey that encompasses seven domains.⁽²⁰⁾

SAMPLE AND SURVEY DISTRIBUTION

Because our intention was to provide data for trainees and early transplant hepatologists (<7 years since completion of fellowship training), we limited our survey distribution to first-time test takers of the ABIM Transplant Hepatology Initial Certification Exam from 2014 to 2018. A total of 256 first-time test takers were identified with an associated email addresses for survey distribution. Automated invitations with unique links (allowing completion of only one survey per respondent) were sent weekly \times 3 beginning on May 8, 2019. A final email reminder was sent by members of the AST LICOP to individuals who had not yet started or completed the survey. The survey was closed on June 24, 2019.

SURVEY GROUPS AND TIME-UNIT CALCULATION

To compare responses based on practice setting, respondents were divided into three self-identified groups: university hospital (includes Veterans Affairs medical centers), non-university hospital, and research (any practice setting with >50% protected time for research *or* research funding of any amount). We did not further subdivide practice setting based on the presence or absence of liver transplant program, although these data were collected for all respondents.

To generate a singular value to encompass clinical and nonclinical work hours over the course of a year (calculated as 48 weeks total to account for paid time off), a time-unit value was calculated for each respondent to quantify total hours spent on inpatient clinical care, outpatient clinical care, non-reimbursed clinical conferences, and nonclinical role(s) (Supporting Fig. S1). For inpatient clinical care, each work day was estimated to be 12 hours, and for outpatient clinical care, each work day was estimated to be 8 hours. Non-reimbursed clinical conferences and nonclinical roles were calculated using hours per week reported. With the exception of inpatient clinical care, all work-hours per year calculations excluded inpatient time, as it was assumed that these additional responsibilities

(outpatient clinical care, non-reimbursed clinical conferences, and nonclinical roles) would be superseded by inpatient clinical care.

STATISTICAL ANALYSIS

Responses were analyzed using SPSS (version 26; Chicago, IL) and Stata (version 15; College Station, TX). Descriptive statistics included mean and SD for normal data, median and interquartile range (IQR) for nonnormal data, or counts and percentages were used to describe frequency of responses for individual items. Baseline characteristics were compared between male and female survey respondents using chi-square and Kruskal-Wallis tests when appropriate.^(21,22) Spearman correlation coefficient was used to describe relationships between individual survey items and compensation amount.⁽²³⁾

We defined dependent variables for multivariable regression models as follows. Base compensation was defined as a continuous variable in US dollars, and based on annual compensation amount. Burnout was assessed using a nonproprietary, five-category single-item question.⁽¹⁷⁾ For multivariable regression analysis, responses were transformed to a binomial variable, with a positive burnout screen defined as a score of 3 or higher on a five-category ordinal scale as previously described.⁽¹⁷⁾ Job satisfaction was defined using a five-category ordinal scale, with a higher score reflecting decreased job satisfaction.

To assess the association between respondent characteristics and base compensation, univariable linear regression was initially performed, followed by multivariable linear regression using a backwards elimination strategy, retaining only those variables with $P < 0.05$. Two models were constructed to reflect predictors of base compensation: one in only respondents affiliated with liver transplant programs (including transplant volume metrics as independent variables), and the other in all survey respondents regardless of liver transplant program affiliation (excluding transplant volume metrics). Univariable logistic regression analysis was used to identify those baseline characteristics associated with a positive burnout screen, followed by multivariable logistic regression using backwards elimination as with linear regression, to identify the most parsimonious model. Finally, as job satisfaction was defined using an original Likert scale, univariable and multivariable ordinal logistic

regression with backwards elimination was used to define predictors of job satisfaction (odds of 1 unit change in 5-item Likert scale).⁽²⁴⁾ For regression analyses, only complete responders were included.

Results

DEMOGRAPHICS AND PRACTICE SETTING

Of the 256 email invitations sent, 154 (60%) invitations were opened. Overall, 55% (140 of 256) of respondents started the survey, with 89% (124 of 140) of respondents completing the survey in its entirety (Supporting Table S1). Respondents had a median age of 38 (IQR 36–40) years, had been in practice for a median of 4 (IQR 3–6) years since completion of fellowship, represented all geographic regions of the country (Supporting Fig. S2), and 44% were women. All respondents were adult transplant hepatologists, and most (86%, 120 of 139) were practicing in a liver transplant program.

There were no differences in baseline demographics by practice setting; however, individuals at non-university-affiliated hospital (UH) clinical practices had a lower frequency of associated liver transplant programs and fewer hepatologists, although a similar ratio of number of transplants per hepatologist (Table 1). A higher rate of respondents who had research-predominant practices remained at the institution where they completed fellowship training

(60%) than those in both UH clinical (35%) and non-UH clinical (16%).

CLINICAL ROLES

Clinical activity across practice settings is outlined in Table 2. Most of the patient care focused on liver disease, with a similar frequency of transplant and nontransplant care across practice settings. Non-UH clinical respondents had a lower frequency of staffing a primary inpatient service and fewer hours spent in clinical conferences than UH clinical or research respondents. Non-reimbursed clinical care was similar across practice settings with the exception of clinical conferences, which was higher in the UH-clinical practice setting. Overall, median clinical hours per year was lower in the research predominant cohort compared with UH-clinical and non-UH clinical, with no differences in the latter two.

Differences in clinical practice were noted between men and women (Supporting Table S2). Women had a higher frequency of affiliation with a liver transplant program (95% vs. 79%, $P = 0.007$) and corresponding increased percentage of liver transplant-related clinical time with reduced percentage of non-liver clinical time compared with men. Men performed a median of one half-day more of endoscopy per week. Although women were more likely to attend on an inpatient primary service than men (73% vs. 47%, $P = 0.004$), there were no differences in weeks of inpatient service (accounting for both primary and consult service) nor on-call weeks.

TABLE 1. BASELINE DEMOGRAPHIC AND PROGRAM DATA

	UH-Clinical (n = 79)	Non-UH Clinical (n = 25)	Research (n = 35)	PValue
Age (years)	38 [36-40]	39 [37-41]	39 [36-40]	0.1913
Gender				
Female	44%	40%	49%	0.8025
Male	56%	60%	51%	
Years from training	4 [2-5]	5 [3-6]	4 [3-6]	0.6028
Transplant hepatology pilot fellow	22%	32%	11%	0.1503
Remained at fellowship institution	35%	16%	60%	0.0019
Liver transplant program	91%	64%	91%	0.004
# of transplants	100 [80-120]	80 [50-115]	120 [70-140]	0.094
# of hepatologists in practice	7 [5-9]	4 [1.5-6]	8 [5-12]	<0.0001
# of transplants/hepatologist	15 [10-18]	16 [11-23]	13 [8-17]	0.1165

Note: All values are reported as median [interquartile range] or percentage of respondents. Chi-square test was used to compare differences across groups for percent response. Kruskal-Wallis test was used to compare differences across groups for median value responses. Response rate for this section = 139 of 140 (99%).

TABLE 2. CLINICAL ACTIVITY

	UH-Clinical (n = 73)	Non-UH Clinical (n = 23)	Research (n = 35)	PValue
Patient population (%)				
Liver, transplant	40 [26-50]	32 [13-55]	35 [30-50]	0.502
Liver, nontransplant	48 [35-60]	50 [30-60]	50 [40-70]	0.347
Non-liver	5 [0-19]	10 [1-35]	5 [0-10]	0.151
Outpatient activity (0.5 days/week)				
Clinic	4 [3.25-6]	5 [4-6.5]	2.5 [2-4]	<0.001
Endoscopy	1 [1-2]	1 [1-3.5]	1 [0.5-2]	0.026
Inpatient activity (weeks/year)				
Staff a primary inpatient service	66%	30%	63%	0.011
Staff an inpatient consult service	89%	74%	89%	0.181
Total inpatient weeks	10 [8-13]	12 [8-18]	8 [4-10]	<0.001
Take overnight/weekend call	97%	96%	91%	0.319
Call weeks	8 [6-11]	8 [5.8-11.3]	6 [4-10]	0.034
Non-reimbursed activity (hours/week)				
Clinical conferences	4 [3-5]	3 [2-4]	3 [3-4]	<0.001
Clinical follow-up (e.g., calls)	4 [2-8]	4 [1-6]	3 [2-5]	0.112
Clinical work at home	5 [2-10]	4 [1-6]	4 [2-6]	0.115
Time unit (hours per year)	2,317 [2,034-2,726]	2,311 [2,194-2,759]	1,508 [1,114-2,205]	<0.001

Note: All values reported as median [interquartile range] or percentage of respondents. Chi-square test was used to compare differences across groups for percent response. Kruskal-Wallis test was used to compare differences across groups for median value responses. Response rate for this section = 131/140 (94%).

NONCLINICAL ROLES

Most respondents (85%, 111 of 131) had a formal nonclinical role (e.g., research, medical education, administrative), with 39% (50 of 131) having two or more additional roles. Nonclinical roles across practice settings are outlined in Table 3. Given the predefined criteria, there were significant differences in research roles in the research-predominant group compared with UH clinical and non-UH clinical. Participation in and the amount of protected time for medical education and administrative roles were similar across groups, but administrative roles were more likely to be associated with salary support (65% vs. 23%, $P < 0.001$).

There were differences in nonclinical roles between genders noted (Supporting Table S3). Participation in research was similar between genders; however, women had a median 1 half-day more per week of protected time and had a numerically, although not statistically, higher frequency of start-up funding. Despite similar frequency of medical education roles, women were less likely to have protected time for this role compared with men (33% vs. 65%, $P = 0.072$). There were no differences between genders relative to administrative roles.

COMPENSATION

Overall, the median base salary was US \$300,000 (\$263,750-\$326,250), with no differences across geographic regions (Supporting Fig. S3). A total of 66% reported salary support from one or more sources outside their division: 29% from the Department of Medicine, 23% from the health system, 23% from the transplant program, and 8% from the affiliated medical school. Across practice settings, median base salary was higher in the non-UH clinical group compared with the UH-clinical and research-predominant group, with no significant difference in base compensation in the latter two groups (Table 4). Most of the overall respondents (74%, 93 of 126) reported a salary-based compensation model, while 24% reported a RVU-based compensation model (Table 4).

Of all the respondents, regardless of compensation model, 55% reported that they “did not know” their monthly wRVU productivity. Notably, respondents receiving salary-based compensation were more likely to be unaware of wRVU productivity compared to those with RVU-based compensation (65% vs. 25%, $P < 0.001$). Of those who reported their wRVU, the overall median monthly wRVU was 400 (IQR 300-500), with a lower wRVU reported

TABLE 3. NONCLINICAL ACTIVITY

		UH-Clinical (n = 73)	Non-UH Clinical (n = 23)	Research (n = 35)	P Value
Research	Participate in research	68%	65%	100%	<0.001
	Half-days protected per week	1 [0-2]	0 [0-1]	4 [2-7]	<0.001
	Received start-up funds	11%	0%	66%	<0.001
	Additional research funding	0%	0%	100%	<0.001
	Salary support from research funds	0%	0%	66%	<0.001
Med Ed	Formal role in medical education	33%	13%	23%	0.160
	Have protected time	54%	100%	38%	0.265
	Hours protected per week	5 [2-10]	4 [4-4]	2 [2-6]	0.429
	Receive salary support for this role	17%	67%	25%	0.169
Admin	Formal administrative role	32%	22%	17%	0.271
	Have protected time	52%	100%	83%	0.108
	Hours protected per week	5 [4-8]	4 [1-9]	7 [4-13]	0.425
	Receive salary support for this role	61%	80%	67%	0.866
	Time unit (hours per year)	288 [136-520]	328 [124-384]	800 [378-1176]	<0.001

Note: All values are reported as median [interquartile range] or percentage of respondents. Chi-square test was used to compare differences across groups for percent response. Kruskal-Wallis test was used to compare differences across groups for median value responses. Response rate for this section = 131 of 140 (94%).

TABLE 4. COMPENSATION AMOUNT AND STRUCTURE

	UH Clinical (n = 70)	Non-UH Clinical (n = 20)	Research (n = 33)	P Value
Base compensation	US \$295,000 [270,000-310,000]	US \$360,500 [322,500-436,250]	US \$270,000 [227,500-307,500]	<0.001
Compensation structure				
Salary	77%	65%	74%	0.564
RVU-based	20%	35%	26%	
Other	3%	0%	0%	
Known monthly wRVU	46%	50%	41%	0.774
Received sign-on bonus	61%	75%	47%	0.131
Amount	US \$15,000 [10,000-30,000]	US \$22,500 [8,750-32,500]	US \$27,500 [10,000-50,000]	0.300
Received incentive bonus	65%	75%	71%	0.696
Amount	US \$17,500 [7,500-22,500]	US \$12,500 [7,500-22,500]	US \$15,000 [7,500-22,500]	0.560
Outside salary support	66%	70%	62%	0.841

Note: All values are reported as median [interquartile range] or percentage of respondents. Chi-square test was used to compare differences across groups for percent response. Kruskal-Wallis test was used to compare differences across groups for median value responses. Response rate for this section = 123 of 140 (88%).

for research-predominant faculty (275 [IQR 242.5-411.25]), but with no differences between UH clinical (400 [IQR 350-490]) and non-UH clinical (400 [IQR 333-500]) respondents. There was no relationship between self-reported wRVU and base compensation (Spearman's $\rho = 0.27$, $P = 0.079$). Among

clinical activity responses, self-reported wRVU had the strongest correlation with half-days of endoscopy per week (Spearman's $\rho = 0.49$, $P < 0.001$).

Univariable and multivariable predictors of base compensation are outlined in Table 5 (multivariable) and Supporting Table S4 (univariable). In the

TABLE 5. MULTIVARIABLE PREDICTORS OF BASE COMPENSATION

	All Respondents		LT Center Respondents	
	n = 120		n = 106	
	β coefficient	95% CI	β coefficient	95% CI
Non-UH clinical setting	83,644	[49,717-117,571]	74,995	[39,699-110,290]
Male sex	22,999	[-1,343-47,340]	25,376	[3,168-47,583]
Inpatient hour per year	29	[3-55]	33	[5-62]
1% non-liver transplant liver clinical time	-876	[-1,523 to -230]	-957	[-1,589 to -325]

TABLE 6. PREDICTORS OF PHYSICIAN BURNOUT

	Univariable		Multivariable	
	OR	95% CI	OR	95% CI
Unit decrease in job satisfaction	6.09	[2.94-12.60]	7.56	[2.61-21.91]
Hours of clinical work at home per week	1.11	[1.02-1.20]		
Weeks on call per year	1.08	[0.99-1.18]		
Percent non-liver clinical time	1.02	[0.99-1.05]		
Outpatient days per year	1.01	[1.00-1.02]		
Percent research time	0.98	[0.96-1.00]		
Nonclinical hours per week	0.93	[0.88-0.98]	0.92	[0.82-0.99]
Number of hepatologists	0.91	[0.82-1.01]		
Liver transplant volume	0.80	[0.64-1.02]		
Nonclinical-protected half days per week	0.78	[0.64-0.95]		
Research-protected half days per week	0.69	[0.53-0.89]		
Adequate nonclinical support	0.55	[0.38-0.82]		
Adequate clinical support	0.41	[0.28-0.59]	0.39	[0.21-0.71]
Salary support outside division	0.37	[0.17-0.80]	0.28	[0.08-0.99]

Note: Values are adjusted for metrics of transplant volume, clinical productivity (including FTE and clinical time), base compensation, and practice setting. A total of 103 respondents were included in the analysis.

multivariable model including all respondents, practice in a non-UH clinical setting was most strongly associated with baseline compensation. Each inpatient hour per year added \$29 to base compensation (or \$2,436 per inpatient week [7 days, 12 hours per day]), while every percent of nontransplant liver clinical time reduced base compensation by \$876. Multivariable predictors of base compensation for respondents with affiliated liver transplant programs (88% of complete respondents, n = 106) were similar (Table 5). In addition to predictors noted in the full cohort, men had

a significantly higher base compensation compared with women, even after adjusting for metrics of transplant volume, clinical productivity (including full-time equivalent [FTE] and clinical time), nonclinical protected hours, and practice setting. Although salary support from outside the division was common, this did not influence base compensation in either model.

STUDENT LOANS

Most respondents (52%) reported student loan debt with a median US \$175,000 (IQR \$75,000-\$237,500), 45% of whom noted that this influenced their ultimate job decision. There was no difference in frequency of student loan debt, amount of student loan debt, or percentage who reported that student loan debt influenced their job decision across practice settings, although research-predominant respondents were more likely to receive loan repayment (Supporting Table S5).

BURNOUT AND JOB SATISFACTION

Among all respondents, 35% (43 of 124) screened positive for burnout, with no difference across practice settings. In multivariable logistic regression, every unit decrease in job satisfaction (5-item Likert scale) increased the odds of positive burnout screen by 7.56-fold (95% confidence interval [CI], 2.61-21.91) (Table 6). Several factors, however, reduced the odds of a positive burnout screen. Salary support outside division reduced odds by 72% (odds ratio [OR] 0.28, 95% CI 0.21-0.71), every unit increase in agreement with adequacy of clinical support staff reduced odds by 61% (OR 0.39, 95% CI 0.21-0.71), and every nonclinical hour per week reduced odds by 8% (OR 0.92, 95% CI 0.82-0.99). The following factors were *not* associated with a positive burnout screen: gender, liver transplants per hepatologist, wRVU,

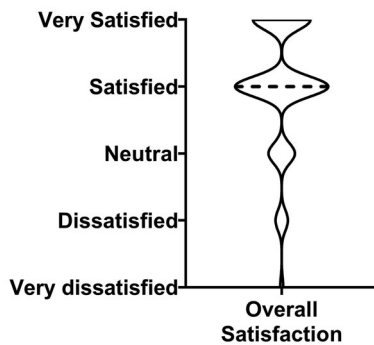


FIG. 1. Overall job satisfaction. Dashed black line indicates median response.

student loan debt, time from fellowship completion, base compensation, inpatient time-unit (total hours per year), outpatient time-unit (total hours per year), and participation in nonclinical role.

Regarding overall job satisfaction, most of the respondents were satisfied (48%) or very satisfied (30%) in their current position (Fig. 1). There was no difference in job satisfaction across practice settings or between genders. The only significant predictors of reduced job satisfaction in a multivariable ordinal logistic regression analysis were weeks on call per year (OR 1.12, 95% CI 1.03-1.23) and percent non-liver clinical time (OR 1.03 95% CI 1.00-1.05), while adequate clinical support staff improved job satisfaction (OR 0.53, 95% CI 0.39-0.71) (Supporting Table S6). Base compensation had no association with overall job satisfaction. A similar number of respondents reported that their job satisfaction had increased since fellowship completion (38%) as those who reported that their job satisfaction had decreased (32%). Importantly, respondents who screened positive for burnout were more likely to report a relative decrease in job satisfaction compared with those who screened negative (56% vs. 19%, $P < 0.001$). Additional metrics of job satisfaction based on RAND Physician Survey questions organized by domain are summarized in Fig. 2.

Discussion

This study provides comprehensive data on both clinical and nonclinical roles of transplant hepatologists and their compensation structure across practice settings, building on prior studies to generate more

granular clinical data and reflect nonclinical roles not previously reported. Importantly, our results demonstrate that early career transplant hepatologists serve multiple roles, with 85% having one or more nonclinical roles across all practice settings, with varying degrees of financial support for these efforts beyond their clinical revenue generated. Medical educators had the lowest rate of salary support, despite similar hours of protected time to colleagues with administrative roles, an area for which additional institutional support may be warranted. Although relevant in all areas of medicine, nonclinical roles (research, education, and administrative) are essential to the growth and function of multidisciplinary liver transplant programs. Recognition of individual nonclinical efforts is critical in assessing these individual programmatic contributions in transplant medicine and assigning these roles value.⁽⁴⁾

Our survey results highlight several important observations regarding base compensation for early career transplant hepatologists. Average base compensation across all practice settings was US \$305,496. This is similar to the average base salary reported in previous hepatology-specific surveys (US \$315,066 for all respondents; US \$273,507 for those with <5 years of experience based on 67 [29%] total respondents).⁽⁸⁾ When the average incentive bonus in our survey is considered (68% of respondents received average annual incentive of US \$15,232), total compensation (defined as base salary + annual incentive bonus) is also similar to junior academic gastroenterologists (US \$329,600 for assistant professors), based on the most recent Association of American Medical Colleges Faculty Salary Survey.⁽²⁵⁾ Base compensation was significantly higher in the non-UH clinical setting versus the UH clinical setting, despite no difference in self-reported wRVU productivity, clinical time, or transplants per hepatologist. It is possible that differences in programmatic structure (e.g., cost-sharing models for transplant institutes), patient insurance pool, or nontransplant institutional support may explain this discrepancy, but more data are needed.

After adjusting for practice setting, clinical service time, FTE, and nonclinical protected time, female gender was a significant predictor of lower base compensation in most of the respondents affiliated with a liver transplant center (88%). In fact, women, on average, earned 8% less than men, or US \$25,376, in our multivariable regression model. Notably, the percentage of women in our study (44%) is representative

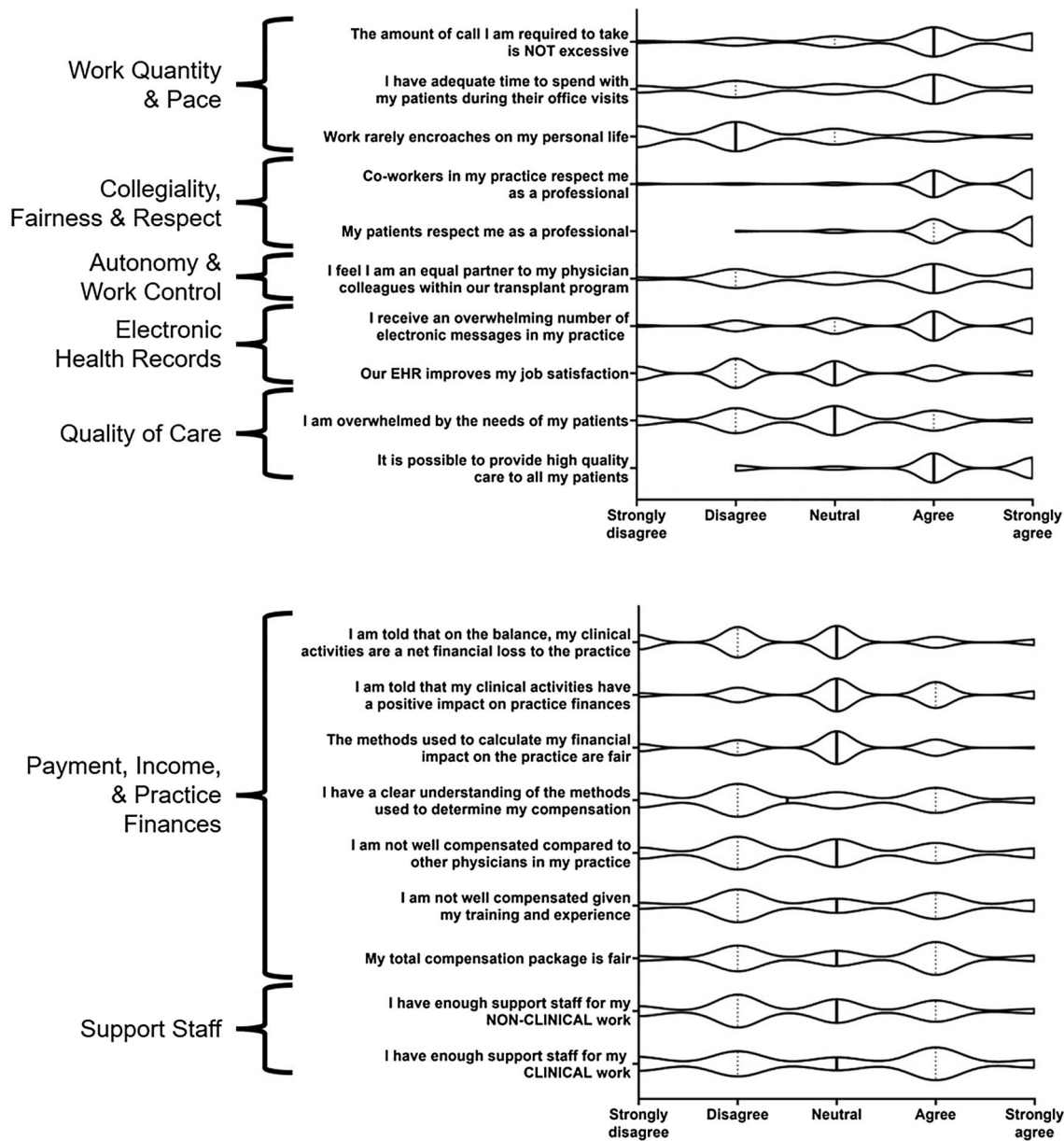


FIG. 2. RAND Physician Satisfaction Survey. Responses to select RAND Physician Satisfaction Survey questions are organized by domain (left column). Solid black line indicates median response, and dashed line indicates quartile ranges.

of baseline hepatology workforce estimates (47%) recently published.⁽¹⁵⁾ A gender gap in compensation has been widely recognized across medical specialties and practice settings.^(26,27) Additional studies are planned to exclude potential confounders and to identify strategies to eliminate this gap, specifically among transplant hepatologists.

Most of the respondents (74%) reported a salary-based compensation model. Previous compensation-based surveys have sought to define dollar per

wRVU.⁽⁸⁾ Although dollar per wRVU remains a potentially important metric for programmatic leadership, based on our survey results, this is not as relevant to individual compensation discussions for a large percentage of transplant hepatologists. In addition, transplant hepatologists generate significant downstream revenues through multidisciplinary collaboration with other specialties (e.g., transplant surgery, diagnostic, interventional radiology); thus, their true value to the health system is likely underestimated by wRVU

productivity alone.⁽²⁸⁾ This assertion is supported by the fact that 46% of respondents reported direct salary support from outside the department of medicine, either from the transplant program itself or the health system. Notably, transplantation remains the last remaining model in direct CMS reimbursement and incorporation of cost report data (reflecting non-reimbursed clinical care) and associated reimbursement would be ideally incorporated into future studies, to shed additional light on revenue streams related to non-RVU-generating clinical activities.

This is the first study to quantify student loan debt for transplant hepatologists. Student loan debt may disproportionately affect transplant hepatologists, given their delayed earning potential due to additional years of training. Most of the respondents (52%) reported student loan debt with a median amount of US \$175,000. Of those with student loan debt, 45% noted that this affected their ultimate job decision. This rate is triple that reported in a recent systematic review and meta-analysis of medical students, in which 15% reported student loan debt influencing subspecialty training.⁽²⁹⁾ Interestingly, increasing amounts of debt have been associated with decreased likelihood of specialization for both pediatric and internal medicine residents.^(30,31) Programs such as the newly ABIM-approved training pathway for dual certification in gastrointestinal and transplant hepatology (formerly known as the Pilot Program) in part addresses this concern by condensing clinical training, shortening time to completion of training, and increased income. In addition, student loan debt has been shown to negatively correlate with sustained research careers.⁽³²⁾ Only 25% of respondents received any form of loan repayment; therefore, attention to this growing problem may be necessary to both recruit and retain transplant hepatologists, including physician-scientists, moving forward.

It is important to acknowledge our findings on burnout: Approximately one-third of survey respondents screened positive for burnout. This is, to our knowledge, the first survey assessing burnout rates among junior transplant hepatologists. The rate appreciated in our cohort is similar to burnout rates specific to emotional exhaustion (40%) reported in transplant surgeons, although lower than that reported of gastroenterology colleagues (49%) and physicians in general (44%).^(6,9,33) Early career

physicians are more susceptible to burnout, and surveys specific to practicing gastroenterologists have recognized a higher risk of burnout in junior faculty compared with their senior peers, highlighting the importance of this finding in our study.^(34,35) Outside salary support was associated with a 72% lower risk of burnout, independent of compensation amount. We hypothesize that institutional recognition of nonbillable work provides validation of these programmatic contributions to individuals and reduces burnout, a phenomenon observed in other high-pressure medical environments within which meaningful recognition has shown to reduce burnout.⁽³⁶⁾

Despite the incidence of burnout, overall job satisfaction was high in our study, with 78% of respondents reporting satisfaction in their current position, although 32% of respondents reported a decline in overall job satisfaction since beginning fellowship. Most respondents (63%) disagreed with the statement that “work rarely encroaches on my personal life.” This percentage exceeds that reported for internal medicine subspecialties in 2017 (43%) and is of particular importance given that satisfaction with work-life integration has been associated with physician burnout.⁽³⁷⁾ Overall satisfaction with electronic health records (EHRs) was poor, with only 23% of respondents feeling that the EHR improved job satisfaction and 60% receiving an overwhelming number of EHR messages. EHR usability has been recognized as a predictor of physician burnout, and therefore represents a potential area for improvement in care delivery for transplant hepatologists.⁽³⁸⁾

Although increased compensation has been noted as a potential remedy to physician burnout and poor job satisfaction, base compensation was not associated with burnout or job satisfaction in our survey.⁽⁶⁾ This finding suggests that increased compensation alone may not remedy a poor work environment, an important recognition for both transplant hepatologists and program administrators. Only 44% of respondents agreed that they had adequate clinical support staff, a factor associated with rate of burnout and job satisfaction in our study. Ensuring adequate clinical support staff should be a focus of both program administrators and transplant hepatologists, to mitigate risk of burnout and to improve job satisfaction. Notably, most of the respondents in our study did not feel that

they had a clear understanding of methods used to determine their compensation; therefore, the results presented may increase transparency to improve this satisfaction metric.

We acknowledge the following limitations to our study. All responses are self-reported; therefore, there is potential for inaccurate responses, such as base compensation or wRVU. Furthermore, there was potential reporting bias relative to wRVU productivity skewed heavily to the minority of respondents with RVU-based compensation models that limited further analysis of this metric and would caution further inferences from this limited survey metric. Our study, by design, is generalizable only to early career transplant hepatologists, but early career individuals may most accurately reflect contemporary practice patterns and therefore offer the most relevant information for future negotiations. Although we surveyed the presence and source of outside salary support, we did not ask respondents to quantify this support, limiting our ability to determine the impact of amount of support on base compensation. Because we used a single-item questionnaire to assess burnout, more discrete analysis of components contributing to burnout (e.g., emotional exhaustion vs. depersonalization) is not possible. Similarly, we limited RAND Physician Satisfaction questions to those felt to be most relevant to our target audience, to avoid survey fatigue; therefore, this may not completely capture the spectrum of satisfaction domains. We did not collect data on number of annual vacation days, instead assuming 20 vacation days annually for our time-unit calculations. Variations in vacation time allowances or time taken may additionally affect job satisfaction and burnout. Our survey response rate was 55%, and while not reflective of the entire cohort, represents an adequate sample size, exceeding response rates (18%-32%) of surveys targeting similar professional cohorts.^(8,39)

In conclusion, our survey results provide a framework for both individuals and programs alike, to understand varied roles of transplant hepatologists, compensation structure, and impact of these factors on physician burnout and job satisfaction. In so doing, we hope to provide a valuable resource to increase transparency and empower not only early career transplant hepatologists, but also trainees interested in pursuing careers in transplant hepatology. Additional studies are needed both to expand similar work to transplant hepatologists in all career stages and further define

contributors to physician burnout and job satisfaction in this population.

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