Factors influencing anesthesia residency selection: impact of global health opportunities

Facteurs influençant le choix de la résidence en anesthésie: impact des offres de santé globale

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Abstract

Purpose There is growing evidence to suggest that the current generation of medical students and young physicians is interested in global health. However, there are few data on the interest in global health by students pursuing a career in anesthesiology. The objective of this survey was to evaluate the importance of global health opportunities in regard to applicants' choice of anesthesiology residency programs.

Methods Anesthesiology residency program directors in the United States were invited to distribute an online survey to recently matched residents. To reduce study bias, the survey included a wide selection of reasons for program choices in addition to global health.

Participants were asked to rate independently, on a scale of 1 to 10 (1 = least important, 10 = most important), the importance that each factor had on their selection of an anesthesiology residency program.

Results Of the 117 U.S. anesthesiology programs contacted, 87 (74%) distributed the survey. Completed surveys were obtained from 582 of 1,092 (53%) polled participants. All factors assessed were rated between 5 and 9 and the global health median [interquartile range] rating was 6 [3–7]. Nearly half of the survey respondents were interested in incorporating global health into future careers. More than three-quarters reported being interested in participating in, or reading about, global health activities during their residency. Responders with previous global health experience, or who were interested in an “in-country” experience, were more likely to choose programs that had global health opportunities available during residency.

Conclusions Anesthesia residency program applicants are interested in global health. Having a global health opportunity was an important reason for choosing a residency program, comparable to some more traditional factors. Regardless of previous global health experience, the majority of future anesthesia residents are either planning or considering participation in global health activities during or after training.

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Résumé

Objectif Il existe de plus en plus de données probantes suggérant que la génération actuelle des étudiants en médecine et des jeunes médecins s'intéresse à la « santé globale ». Il y a cependant peu de données sur l'intérêt des étudiants poursuivant une carrière en anesthésiologie pour la santé globale. L'objectif de cette enquête était d'évaluer

l'importance qu'avaient pour les candidats les opportunités de santé globale par rapport au choix de programmes de résidence en anesthésiologie.

Méthodes Des directeurs de programmes de résidence en anesthésiologie des États-Unis ont été invités à distribuer une enquête en ligne à des résidents récemment arrivés. Pour limiter les biais de l'étude, l'enquête a inclus un vaste choix de raisons pour avoir retenu le programme, en plus de la santé globale. On a demandé aux participants d'évaluer de façon indépendante l'importance de chaque facteur sur leur choix d'un programme de résidence en anesthésiologie en utilisant une échelle de 1 à 10 (1 = le moins important, 10 = le plus important).

Résultats Sur les 117 programmes d'anesthésiologie contactés aux États-Unis, 87 (74 %) ont distribué l'enquête et sur les 1092 participants interrogés, 582 (53 %) ont répondu à la totalité de l'enquête. Tous les facteurs évalués ont été cotés entre 5 et 9 et la notation médiane de la santé globale [intervalle interquartile] était de 6 [3-7]. Presque la moitié des personnes interrogées étaient intéressées à l'inclusion de la santé globale dans leur carrière future. Plus des trois quarts ont indiqué envisager de participer à des activités de santé globale ou lire à leur sujet au cours de leur résidence. Les répondants ayant une expérience antérieure en santé globale, ou intéressés par une expérience « dans le pays », étaient plus susceptibles de choisir des programmes proposant des options de santé globale au cours de la résidence.

Conclusions Les candidats aux programmes de résidence en anesthésie sont intéressés par la santé globale. Avoir une possibilité de santé globale était une raison importante, comparable à certains facteurs traditionnels, pour choisir un programme de résidence. Indépendamment de leur expérience antérieure en santé globale, la majorité des futurs résidents en anesthésie prévoient ou envisagent de participer à des activités de santé globale pendant ou après leur formation.

There is growing evidence that the current generation of medical students are interested in global health.¹ According to the Association of American Medical Colleges data, more than 65% of incoming medical students have an interest in pursuing global learning opportunities during their four years.² Over the past 35 years, this increased interest has been paralleled by a rise in global health opportunities during medical school training. In 1978, only 5.9% of graduating medical students reported participating in an “abroad” elective during medical school.^A This is in

contrast to the 30.2% who reported participating in “global health experiences” in 2013.^B Numerous residency programs, including pediatrics, general surgery, emergency medicine, internal medicine, family medicine, and anesthesiology, now offer international electives or global health tracks in their curricula.³⁻⁸

Research in family medicine, emergency medicine, and pediatrics suggests that interest in global health has started to influence medical students' selection of residency programs.⁹⁻¹² A 2012 survey of resident members of the American Society of Anesthesiologists suggested that anesthesia residents have an interest in global health outreach, and the availability of a global health outreach residency track may influence residency ranking lists.³ The results of the 2012 study were limited by self-selection bias as it was labelled a “Global Health Survey.” Thus, possibly only those individuals interested in global health may have chosen to participate in the survey.

The objective of our study was to conduct an unbiased, nationwide survey of all final-year medical students and physicians who had already matched (during the 2012-2013 cycle) with a U.S.-based anesthesiology residency program to assess the impact of global health opportunities on applicants' residency program selection. The study also aimed to characterize participants' global health interests and measure how global health experiences prior to residency program selection might influence attitudes toward future global health opportunities.

Methods

Survey design

Institutional Review Board exemption was obtained from Emory University School of Medicine (June 2013). A cross-sectional survey was created to record and evaluate factors influencing candidates' selection of an anesthesiology residency program through the 2013 National Residency Matching Program Main Residency Match® (the “Match”). The 14 questions for the survey were generated from literature reviews, researchers' input, and recommendations from colleagues with backgrounds in anesthesiology, global health, and epidemiology. A pilot survey was administered to anesthesiology residents (Emory University School of Medicine, March 2013) to assess the content validity of the survey. Anesthesiology residents were chosen for their similarity to the study's target population. Their feedback was used to design this study's survey final content

^A Association of American Medical Colleges. Medical Student Graduation Questionnaire: 1978 All Schools Summary Report. Obtained by special permission.

^B Association of American Medical Colleges. Medical Student Graduation Questionnaire: 2013 All Schools Summary Report. Obtained by special permission.

(Supplemental Table A; available as Electronic Supplementary Material). The final survey assessed three domains: 1) demographics (sex, age, family status, country of birth); 2) global health opportunities, including 14 factors that influenced their rank order list for the 2013 Match (e.g., diversity in the clinical experience, geographic location, program reputation); and 3) global health interests. For factors influencing their rank order list for the 2013 Match, participants were asked to rate, on a scale of 1 to 10 (1 = least important, 10 = most important), the importance that each factor had on their selection of an anesthesiology residency program. Among the 14 factors listed, participants were asked to pick the seven factors that most influenced their program ranking list and the three factors that least influenced their ranking list. Global health interest questions required nominal responses. The survey was broadly titled “Factors Influencing Anesthesia Residency Selection.” One of the goals of this broader survey approach was to reduce self-selection bias.

Survey administration

To obtain a list of the U.S. accredited anesthesiology residency programs we accessed FREIDA, an online database managed by the American Medical Association that lists information for graduate medical education programs accredited by the Accreditation Council on Graduate Medical Education.¹³ Non-approved residency programs were not included in our study. With support from the Society of Academic Anesthesiology Associations, a description of the project, along with a link to the online survey, was individually emailed to 117 anesthesiology residency program directors in the United States.

These directors were asked to forward the invitation to each of their newly matched residents from the 2013 Match. An individual’s participation was voluntary and anonymous. The Survey Monkey website (Survey Monkey, Palo Alto, CA, USA) was used for survey distribution and data collection from June 1 to August 2, 2013. Survey participants were not contacted directly. Survey responses were collected anonymously. After clicking on the survey link, respondents were given the option to “opt out” of the study. In addition, a participant was able to complete the survey only once. To increase response rates, two reminder emails as well as follow-up telephone calls were made to program directors who had not yet forwarded the survey. In addition, program directors who agreed to participate in the study were asked if their residency programs offered global health opportunities for residents.

Statistical analysis

Data were analyzed using SAS software, version 9.4 (SAS Institute Inc., Cary, NC, USA). Descriptive statistics

including means (standard deviation [SD]), medians [interquartile ranges (IQR)], and percentages were calculated. Wilcoxon tests were used to compare importance ratings across the factors that may affect residency selection. Pairwise comparisons between factors were analyzed with the Dunn method. *P* values from this test reflect a Bonferroni adjustment for multiplicity. Thus, the significance threshold for these comparisons was $P < 0.05$. The associations between previous global health experience and global health attitudes were estimated using Chi-square tests. A median test was conducted to compare the importance of global health opportunities in residency selection between participants with and without previous global health experience. For these analyses, the significance threshold was adjusted ($P < 0.005$) using the Bonferroni adjustment. Finally, a multivariable hierarchical logistic regression model (SAS GLMMIX procedure) was used to determine if these global health aspirations related to whether students matched to a residency program that offered global health opportunities. Specifically, the independent measures included were interest in global health elective occurring “in country” (clinical, teaching, or research experience) (yes/no); willingness to use vacation time for international electives (yes/no); willingness to finance an international elective personally (yes/no); interest in incorporating global health into future practice (yes/no); previous global health experience (yes/no). The collapsing of categories for the global health electives measure was performed to assess the influence of a respondent’s interest in actually travelling to another country for global health opportunities. These types of hierarchical models can account for the nesting of residents in programs (program modeled as a random effect). These associations were reported as odds ratios with 95% confidence intervals (CI).

Results

In all, 87 of 117 (74%) U.S. anesthesia residency program directors from 37 states agreed to forward the survey to their recently matched residents. Among the residency programs that did not participate, two had ended, one had not matched any candidates for the cycle, and 30 either verbally declined to participate or did not forward the survey.

To estimate the number of surveys distributed, each residency program director who agreed to participate in the project was asked how many residents had been accepted into first-year positions through the 2013 Match or outside the Match. Based on these responses, it was estimated that the survey was distributed to 1,092 recently accepted residents into U.S.-based anesthesiology residency

Table 1 Background characteristics of survey participants

Measure	Total sample
Median age (yr)	27 [3]
What is your sex?	
Female	213/570 (37.4)
Male	357/570 (62.6)
Please indicate your marital status from the choices provided.	
Married	221/572 (38.6)
Divorced	5/572 (0.9)
Separated	1/572 (0.2)
Never Married	280/572 (49.0)
Unmarried Couple	59/572 (10.3)
Other	6/572 (1.0)
Do you have children? If so, how many?	
I do not have children	485/574 (84.5)
1	43/574 (7.5)
2	30/574 (5.2)
3	13/574 (2.3)
4	2/574 (0.3)
5+	1/574 (0.2)
What is your country of birth?	
Born in United States	464/564 (82.3)
Born outside United States	100/564 (17.7)
Do you have previous global health experience?	
Yes	220/570 (38.6)
No	350/570 (61.4)

Data expressed as the number of respondents who endorsed that answer/number of complete responses to that specific item (%) or median [interquartile range].

programs. Our final convenience sample included 582 respondents who returned completed surveys, yielding an individual participant response rate of 53.4%. With a sample size of $n = 582$, our study had the ability to detect (at 80% power, $\alpha = 0.05$) importance rating minimum differences of 0.3 points (calculated for a Wilcoxon test with a non-normally distributed outcome) and 12% minimum difference in response rate across two comparison groups (i.e., having previous global health experience vs not having it).

Demographic characteristics of the survey respondents are shown in Table 1. Nearly 40% of participants reported having previous global health experience. Median importance ratings for factors assessed by the survey for their impact on residency selection are shown in the Figure.

Overall, respondents assessed all factors as being at least moderately important (median ≥ 5 on the 1–10 scale). Global health, specifically, was rated as moderately important (median [IQR], 6 [3–7]) and was statistically significantly different from the 11 other factors with higher

median importance ratings ((Bonferroni-Dunn post-hoc test: $P < 0.001$ to $P = 0.004$) (Figure). We also asked respondents to pick the seven factors that most influenced their program ranking list and the three factors that least influenced it. Among the seven factors that most influenced their ranking list (i.e., the “top seven”) were those with higher median importance ratings in the previous survey questions (Supplemental Table B; available as Electronic Supplementary Material). Global health opportunities appeared in only 15% of the respondents’ top 7 list. However, no respondents listed global health opportunities as one of the three factors that least influenced their rank list (i.e., the “bottom three”). Interestingly, some factors with similar or higher median importance ratings compared to global health opportunities did appear in at least some respondents’ bottom three lists. For example, 5 (6%) of respondents ranked geographic location and diversity of clinical experience in their bottom three, and 37% ranked benefits/compensation and simulation as one of the three factors that least influenced their rank list (Supplemental Table B; available as Electronic Supplementary Material).

Nearly half of all participants reported being interested in incorporating global health into their future practice (Table 2). For respondents with previous global health experience, 156 of 219 (71%) reported being interested in incorporating global health into their future practice, whereas only 115 of 350 (33%) of participants with no previous global health experience reported the same interest. Overall, 497 of 564 (88%) of the sample reported an interest in participating in, or learning more about, one of the various types of global health electives listed, and 373 of 564 (66%) reported preferring at least a month-long elective.

The survey responders were interested in a variety of global health opportunities, but 73% (413/564) reported interest in any type of overseas “in country” global health experience, which was defined as one that included a clinical, teaching, or research experience. In addition, 35% (200/565) of survey participants reported being willing to devote a portion of their vacation time to participate in global health opportunities, and 41% (234/568) were willing to finance this experience either partially or fully (Table 2). Not surprisingly, individuals with previous global health experience, compared to those without, were more willing to devote personal vacation time [52% (114/219) vs 25% (86/346)] and finances [53% (116/219) vs 34% (118/349)] to global health opportunities. Finally, the median importance ratings for global health differed based on previous global health experience ($P < 0.001$), with those having previous global health experience rating global health as more important in residency selection (median = 7) compared to those having no previous experience (median = 5).

Figure Importance ratings for factors influencing residency. The line in the centre of each box is the median, the ends of each box represent the interquartile range, and the whiskers extending from each box represent the total range.

Of the responding residency programs, 49 of 87 (56%) reported offering global health opportunities to their residents. As reported in Table 3, individuals interested in global health experiences involving time overseas “in-country” were more likely (odds ratio, 1.53; 95% CI, 1.01 to 2.30, $P = 0.04$) to be matched with programs that offer “global health opportunities.” For the purpose of this analysis, “in-country” included those interested in any type of clinical, educational, or research “in country” elective.

Discussion

In recent years, physicians across multiple specialties have demonstrated an increased interest in global health activities, including, but not limited to, direct patient care, program development, educational initiatives, and research. These findings reflect a major trend in the professional interests of physicians, particularly among those just starting their careers, because a significant number of medical students have had meaningful experiences in global health prior to deciding on a specialty.¹² Our results showed that previous experience in global health among future anesthesiologists (38%) is higher than the 30% reported among all medical students by the Association of American Medical Colleges.^C Almost half of the responders reported that they anticipated incorporating global health into future careers, and more than three-quarters of responders were interested

in either participating in global health activities during their residency or learning more about them. These findings suggest that global health will play a role in the future of our specialty even among those who have not participated in global health opportunities at the time of the matching. Interestingly, the National Residency Matching Program also conducted a general survey of the 2013 Match to evaluate all of the factors that influenced an applicant’s choice in choosing a residency program. Their survey asked applicants to rank 37 factors when considering an anesthesiology residency program. They reported that only 28% of U.S. senior medical students applying for an anesthesiology residency cited opportunities for international experience as a factor in selecting a program, and 21% cited international experience as a factor in their ranking decision. Although the low rates they report are interesting, inference from their data must be limited as there is an absence of detailed methods and any type of sophisticated analysis.¹⁴ Our survey findings suggest that previous global health experience is associated with placement in a program that would offer such opportunities and confirms an interest in global health among future anesthesiologists.

Many specialties, such as pediatrics, surgery, and emergency medicine, have included international electives or formal global health tracts in their residency programs.^{4,7} Although “opportunities” for global health experiences are becoming more commonplace among academic anesthesia departments, as seen in our survey results, formal rotations for global health experiences for anesthesia trainees are still limited. As of 2010, it was suggested that fewer than 20% of accredited anesthesiology resident training programs offered formal international electives.¹⁵ How should anesthesia residency

^C Association of American Medical Colleges. Medical Student Graduation Questionnaire: 2013 All Schools Summary Report. Obtained by special permission.

Table 2 Global health attitudes of participants for total sample and stratified by previous global health experience

Question	Total sample	Previous global health experience (<i>n</i> = 220)	No global health experience (<i>n</i> = 350)	<i>P</i> †
If available, which of the following Global Health Opportunities (GHOs) would you be interested in pursuing?				<0.001
In-country research elective	124/564 (21.9)	64/218 (29.4)	60/346 (17.3)	
In-country clinical experience. Main responsibility would be taking care of patients	375/564 (66.5)	176/218 (80.7)	199/346 (57.5)	
In-country educational experience. Main responsibility would be teaching.	253/564 (44.9)	124/218 (56.9)	129/346 (37.3)	
Interest in any of the above “In-country” electives	413/564 (73.2)	187/218 (85.7)	226/346 (65.3)	
Research elective related to a global health project at a US medical school/institution	108/564 (19.1)	57/218 (26.1)	51/346 (14.7)	
I am not sure if I would pursue any of these opportunities; however, I am interested in learning more about them	122/564 (21.6)	28/218 (12.8)	93/346 (26.9)	
I am not interested in pursuing GHOs during residency	67/564 (11.9)	9/218 (4.1)	58/346 (16.8)	
If available, which length of time would you most prefer for a global health elective?				<0.001
1-2 weeks	127/564 (22.5)	39/216 (18.1)	88/348 (25.3)	
1 month	320/564 (56.7)	147/216 (68.1)	173/348 (49.7)	
3 months	53/564 (9.4)	25/216 (11.6)	28/348 (8.0)	
Not interested	64/564 (11.3)	5/216 (2.3%)	59/348 (17.0)	
If you are interested in participating in an international elective during residency, would you be willing to use part of your vacation time?				<0.001
Yes	200/565 (35.4)	114/219 (52.0)	86/346 (24.9)	
No	310/565 (54.9)	102/219 (46.6)	208/346 (60.0)	
Not interested	55/565 (9.7)	3/219 (1.4)	52/346 (15.0)	
If you are interested in participating in an international elective, would you be willing to finance it, either partially or fully?				<0.001
Yes	234/568 (41.2)	116/219 (53.0)	118/349 (33.8)	
No	275/568 (48.4)	99/219 (45.2)	176/349 (50.4)	
Not interested	59/568 (10.4)	4/219 (1.8)	55/349 (15.8)	
Are you interested in incorporating global health into your practice after residency?				<0.001
Yes	271/570 (47.5)	156/219 (71.2)	115/350 (32.9)	
No	76/570 (13.3)	5/219 (2.3)	71/350 (20.3)	
Not Sure	223/570 (39.1)	58/219 (26.5)	164/350 (46.9)	

* *n* = number of respondents who endorsed that answer/number of complete responses to that specific item (%). †*P* values represent results from Chi-square test. After adjustment for multiple comparisons, *P* < 0.005 was considered statistically significant.

programs and academic departments plan for this shift in priority of our future generation of anesthesiologists? A recent survey of all U.S. anesthesiology residency programs indicated that approximately 91% of the programs believe that there is educational value for residents to participate in global health activities, with 57% of the programs noting that they have had residents and/or faculty who have participated in global health activities.¹⁶ Our survey showed that just over half of the residency programs reported offering a global

health experience for their residents, but the experience was left undefined.

There are numerous documented benefits for an anesthesiology residency program to offer global health opportunities, such as residency recruitment or preparing residents for a career in global health.^{6,9} The educational benefits to U.S. trainees who work in low-resource settings have also been well documented.^{17,18} Despite the fact that opportunities for international electives are increasing

Table 3 Relationship between global health attitudes and being matched with a program that offers global health opportunities

	Matched program offers global health opportunities?*		Crude Odds Ratio† (95% CI)	Adjusted Odds Ratio† (95% CI)	P-value (Adjusted Odds Ratio)
	Yes <i>n</i> = 360	No <i>n</i> = 222			
Interested in global health opportunities occurring “in country” (clinical, teaching, or research experience) ‡	268/350 (76.6)	145/216 (67.1)	1.55 (1.08 to 2.22)	1.52 (1.01 to 2.30)	0.04
Willingness to use vacation time for international electives§	130/350 (37.1)	70/215 (32.6)	1.31 (0.91 to 1.88)	1.15 (0.77 to 1.74)	0.77
Willingness to personally finance international elective	58/352 (42.9)	83/216 (38.4)	1.21 (0.85 to 1.71)	1.07 (0.74 to 1.56)	0.29
Interested in incorporating global health into future practice**	170/352 (48.3)	101/218 (46.3)	1.12 (0.80 to 1.58)	0.84 (0.56 to 1.23)	0.71
Previous global health experience††	58/353 (41.6)	73/217 (33.6)	1.39 (0.98 to 1.99)	1.27 (0.86 to 1.90)	0.27

Note: matching program was included as a random effect for the multivariable hierarchical logistic regression (reflected in adjusted odds ratio).

* *n* = number of respondents who endorsed that answer/number of complete responses to that specific item (%).

† Odds ratios (with 95% confidence intervals) and *P* values are from multivariate hierarchical logistic regression analysis.

‡ Responses to “If available, which of the following Global Health Opportunities (GHOs) would you be interested in pursuing?” coded as 1 = yes to “In-country” research elective, clinical experience or education experience; 0 = “I am not sure if I would pursue any of these opportunities; however, I am interested in learning more about them”; “I am not interested in pursuing GHOs during residency”; or “Research elective related to a global health project at a US medical school/institution.”

§ Response to “If you are interested in participating in an international elective during residency, would you be willing to use part of your vacation time?” coded as 1 = Yes, 0 = No or Not interested.

|| Responses to “If you are interested in participating in an international elective, would you be willing to finance it, either partially or fully?” coded as 1 = Yes, 0 = No or Not interested

** Response to “Are you interested in incorporating global health into your practice after residency?” coded as 1 = Yes, 0 = No or Not sure.

†† Responses to “Do you have previous global health experience?” coded as 1 = Yes, 0 = No.

and global health fellowships are emerging, formal recommendations regarding the role of global health in our trainees’ education are still lacking. With this increased interest in global health, we are obligated to formalize standard global health goals and objectives.

This study has several limitations. First, it used a convenience sample, so it may not be fully representative of our target population. We also do not know what factors contributed to individuals not completing the survey. As with any self-administered survey, results are dependent on the accuracy of the self-reported data and the participants not changing their early survey responses based on later survey questions. In addition, there were no formal definitions provided for the factors or for the individual residency programs defining terms such as “global health opportunities,” so individual interpretation may have affected results. Moreover, participants rated all the factors included in this study as at least moderately important, thereby limiting the comparison of importance ratings across factors. This result was not surprising as the choices had been previously vetted by a pilot survey. Furthermore, the literature has noted that factors such as “geographic location” and “impression of the interview experience”

carry weight in applicants’ ranking their decisions. We included these factors in our survey as points of reference to increase our own understanding of participants’ global health rankings. Although all factors were rated at least moderately important, ratings for global health opportunities were statistically lower than the majority of the other factors. That being said, our study had the power to detect small differences in ratings (< 1 point), and the range of ratings for global health opportunities was broad. It should be noted that our question that asked the respondents to list the three factors that least influenced their rank list did not yield meaningful results, with half of the factors never appearing in the bottom three for any respondent. To better delineate the hierarchy of factors influencing an applicant’s choice of an anesthesia residency, future studies may need to include a broader range of factors (including high-, moderate-, and low-rated factors) or ask participants to rank the importance of factors relative to one another. The response rate of 53% represents only a portion of final-year medical students and physicians who were recently matched into a U.S.-based anesthesiology residency program because not all programs agreed to participate in the survey. Thus, the results of this survey may not be generalizable to all applicants applying to

an anesthesiology residency program. Regardless of these limitations, our findings provide important insight into the factors that influence anesthesiology residency selection and the attitudes of newly matched residents toward global health education. These findings support our hypothesis that global health experiences are of great interest to our anesthesiologists-in-training and that these experiences can provide the foundation for future anesthesia involvement in effective global health outreach.

We concluded that global health is of interest to future anesthesiologists. Although they clearly prioritize such factors as reputation, location, and the diversity of training when choosing a residency program, nearly 50% of the anesthesia Match candidates surveyed are considering incorporating global health into their career and want the opportunity to work in a low-resource setting during their residency training. Offering global health opportunities may make a program more attractive to residency applicants, but the development of formal global health rotations could help support a growing responsibility for anesthesia residency programs to prepare trainees to work in low-resource settings to offer both quality and culturally appropriate anesthetic care.

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