

Resident Physicians' Knowledge of Underserved Patients: A Multi-Institutional Survey

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OBJECTIVE: To measure actual and perceived resident physician knowledge of underserved patient populations.

PARTICIPANTS AND METHODS: Using the existing literature on vulnerable patient populations and interviews with experts in the field, we designed a cross-sectional, multi-institutional survey to assess actual and perceived resident knowledge of topics related to underserved populations. The survey of actual knowledge consisted of 30 multiple-choice questions, and the survey of perceived knowledge consisted of 15 items based on 3-point Likert scales of confidence.

RESULTS: A total of 498 surveys were completed at 18 residency programs representing 7 different specialties at 10 US institutions. Assessment of perceived knowledge demonstrated that residents were very confident only 14.0% of the time, somewhat confident 66.4% of the time, and not at all confident 19.6% of the time. Assessment of actual knowledge revealed that the average percent correct across all 30 questions was 38%. Women scored better than men (average score, 40.6% vs 36.0%; $P=.01$), and African Americans scored higher than members of other racial or ethnic groups (average score, 43.5% vs 38.0%; $P=.04$). Associations between residents' perceived and actual knowledge were generally high.

CONCLUSION: For the US residents surveyed, the actual and perceived knowledge about most topics relating to underserved populations was low, whereas associations between actual and perceived knowledge were high. These findings suggest the need to improve resident education regarding underserved patient populations.

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Resident physicians are often the front line of care for underserved patients, yet they are generally uncomfortable with issues related to underserved patient populations.^{1,2}

Many medical schools are beginning to offer curricula regarding underserved populations, especially in the context of service learning, whereby medical students learn in an environment of direct contact with underserved populations.³⁻¹³ However, residency curricula on underserved patients are less prevalent, and many of those reported in the literature

address specific vulnerable patient populations, including substance abusers and victims of domestic violence.¹⁴ Nevertheless, broader residency-based social medicine curricula regarding underserved population topics are emerging,¹⁵⁻¹⁹ and at least 3 combined internal medicine/health equity 4-year training programs have been established.²⁰⁻²²

Despite these existing curricula and service-learning opportunities, assessment of resident physician knowledge of underserved patient populations has been limited to specific domains, especially cultural competency²³ and health literacy.²⁴ Moreover, a fundamental step to developing effective curricula is basing the content on valid material and obtaining needs assessments from experts and key stakeholders.²⁵ Therefore, as an initial step in developing a curriculum on underserved patient populations, we developed a comprehensive survey about perceived and actual knowledge of underserved patient topics and administered it to a national sample of residents in the United States. We then examined responses for concordance between perceived and actual knowledge of the underserved.

PARTICIPANTS AND METHODS

A total of 956 surveys were distributed to residents in 18 programs representing 7 different specialties at 10 US institutions in the Midwest, West, Northeast, mid-Atlantic, and Southeast. A convenience sample of program directors was invited to participate. Surveys were distributed to all residents in each participating program. The institutional review boards at each of the participating institutions approved the study.

SURVEY QUESTIONNAIRE VALIDATION

According to the validity paradigm for educational research, validity evidence is collected from the following sources: content, response process, internal structure, criteria, and consequences.²⁶⁻²⁹ For this study, we demonstrated content and internal structure (reliability) evidence, which is consistent with the validity emphasis found in many education research reports.^{28,30}

CONTENT VALIDITY

The questionnaire used in this investigation was designed to assess residents' actual and perceived knowledge of

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underserved patient population topics. Content validity was determined by reviewing the literature and seeking expert input to determine the domains relevant to underserved patients. First, a panel of content experts on underserved populations and health equity was identified on the basis of reputation, publications, and leadership in the field. Nine experts from 7 institutions (Harvard, Johns Hopkins, Mayo Clinic, Rockefeller Foundation, US Public Health Service, University of California San Francisco, and the University of North Carolina) were interviewed in June 2006 by telephone using an unstructured interview script with 1 main question and follow-up questions as appropriate. The primary question to the experts was: "What are the issues related to medically underserved populations that are most important for physicians-in-training to understand?" Probing questions were then used to elicit additional ideas from the experts. We defined underserved populations as groups that are traditionally less advantaged or have limited access to the health care system (eg, low income, low education, racial or ethnic minorities, uninsured).

Content validity was also determined by a comprehensive MEDLINE search that was conducted without date restrictions through January 2007 to obtain published literature relevant to the topics identified during the telephone interviews and through author-initiated review of the more comprehensive literature base pertinent to medically underserved populations; we also obtained references from the experts themselves. Articles selected for review were those that corresponded to the topics identified by the experts, as well as additional topics identified by the authors' literature review. This process yielded a distilled list of topics relevant to underserved populations, which was then resubmitted to the expert panel for further revision and assessment of importance. In the end, most of the experts agreed on 3 core domains, each with 5 subdomains. The 3 major domains were access to health care, socioeconomic position and health, and racial and ethnic health disparities.

Survey items were designed by the investigators and survey methodologists at the Mayo Clinic Survey Research Center. The survey content (items) was created to directly reflect the domains and subdomains that were elaborated by the already described iterative expert review. Furthermore, 2 of the experts reviewed the survey items and correct answers. For each of the 15 educational domains identified by the expert needs assessment and literature review, resident physicians rated their levels of perceived knowledge and answered multiple-choice questions to assess their actual knowledge. Perceived knowledge questions were structured on a 3-point Likert scale (very knowledgeable, somewhat knowledgeable, not at all knowledgeable). Actual knowledge was assessed with 30 multiple-choice questions (4-8 response options per question), with 2 questions reflecting

each of the 15 educational domains (for complete survey instrument, see link to eAppendix 1 in Supporting Online Material at end of article).

INTERNAL STRUCTURE VALIDITY AND ITEM ANALYSIS

The validity of "actual knowledge" survey items was determined by calculating item difficulty and discrimination. Item difficulty was deemed acceptable if 30% to 70% of examinees answered the item correctly.³¹ Item discrimination was considered acceptable if positive values were greater than 0.15.³² Although these data are intended to show the validity of the knowledge test scores, they may also be useful when determining how to use our survey items for future studies and curricula. The internal consistency reliability of scores for each of the 3 knowledge domains was determined by calculating Cronbach α , with acceptable values being greater than 0.7.³³

SURVEY ADMINISTRATION

The survey was administered via the Internet by the Mayo Clinic Survey Research Center between October 18, 2007, and January 31, 2008. A multiple-contact data collection protocol was implemented consisting of the following steps: an initial survey with a cover letter or email message explaining that the study was sent to all physician residents listed in the rosters provided by the respective sites; a reminder 1 week after the initial mailing either thanking them for their response if they completed the survey or exhorting them to respond; and a second survey 2 weeks after the reminder, again with a cover letter or email message, to nonrespondents to the previous surveys.

STATISTICAL ANALYSES

Survey results were reported using standard descriptive statistics. The actual knowledge percentage (range, 0%-100%) was obtained for each learner by assessing the proportion of 30 questions each examinee answered correctly. The perceived knowledge percentage (range, 0%-100%) for each domain was calculated by averaging all learner responses (item scale [0-1]: 0 = not at all knowledgeable, 0.5 = somewhat knowledgeable, and 1 = very knowledgeable). Group comparisons of actual knowledge were analyzed by using a 2-sample *t* test or 1-way analysis of variance, when appropriate. Concordance between the actual and perceived knowledge of residents was determined by using the Pearson correlation test of independence. $P < .05$ was considered statistically significant.

RESULTS

A total of 498 surveys (response rate, 52%) were completed by residents in all of the programs surveyed.

TABLE 1. Differences in Actual Knowledge Scores for Surveyed Residents, by Demographic Characteristic

Demographic characteristic	No. (%) of respondents ^a	Actual knowledge (% correct \pm SD) ^b	P value ^c
Sex (n=476)			.01
Male	257 (54)	36.1 \pm 20.1	
Female	219 (46)	40.5 \pm 19.3	
Age (y) (n=492)			.66
\leq 30	364 (74)	38.2 \pm 20.0	
\geq 31	128 (26)	37.3 \pm 19.7	
Race/ethnicity			.04
White	348 (70)	38.7 \pm 20.2	
Black	24 (5)	43.5 \pm 14.3	
Indian/Alaskan	4 (1)	43.3 \pm 22.3	
Latino	21 (4)	32.7 \pm 21.3	
Asian	92 (18)	35.4 \pm 19.0	
Other	9 (2)	21.9 \pm 24.3	
Postgraduate year (PGY) in residency			.85
PGY 1	173 (35)	37.1 \pm 19.9	
PGY 2	144 (29)	37.3 \pm 18.8	
PGY 3	147 (30)	38.8 \pm 20.9	
PGY 4 or more	34 (7)	38.9 \pm 22.1	
Specialty			.07
Internal medicine (categorical)	286 (57)	38.3 \pm 19.8	
Internal medicine (preliminary)	10 (2)	38.0 \pm 22.1	
Primary care internal medicine	25 (5)	45.1 \pm 20.6	
Medicine-pediatrics	25 (5)	39.9 \pm 20.1	
Family medicine	46 (9)	36.2 \pm 20.3	
Pediatrics	28 (6)	38.9 \pm 19.7	
Neurology	25 (5)	41.2 \pm 20.9	
Surgery	53 (11)	29.9 \pm 18.7	
Parental annual income (n=464)			.51
\leq \$50,000	144 (31)	36.3 \pm 18.7	
\$50,001-\$100,000	186 (40)	38.8 \pm 20.7	
$>$ \$100,000	134 (29)	37.9 \pm 20.2	
Parental education level (n=490)			.07
$<$ 4-y degree	98 (20)	39.0 \pm 20.6	
4-y degree	100 (20)	41.7 \pm 18.4	
Postgraduate education	292 (60)	36.5 \pm 20.0	

^a N=498, unless otherwise indicated (not all respondents answered every question).

^b Mean percent correct across all individuals for the given category.

^c P value represents 2-sample *t* test or 1-way analysis of variance, as appropriate.

Demographic characteristics of the survey respondents are shown in Table 1. Most surveyed residents were aged 30 years or younger (74%), male (54%), and white (70%). Most respondents (93%) were in their first 3 years of training (with relatively even distribution across these training levels) and were enrolled in internal medicine training programs (64%); the remainder were enrolled in programs for general surgery (11%), pediatrics (6%), medicine-pediatrics (5%), neurology (5%), and family medicine (9%). Most respondents were raised by parents who earned more than \$50,000 per year (69%) and who had at least a 4-year college education (80%; 60% had postgraduate education).

ASSESSMENT OF KNOWLEDGE SURVEY SCORE VALIDITY

Regarding the validity of "actual knowledge" survey items, 20 of 30 items fell within the range of 30% to 70% correct, and 25 of 30 items fell within the range of 20% to 80% correct. Further, 29 of 30 items had discrimination greater than 0.15, and 24 of 30 items had discrimination greater than 0.30. Cronbach α for the major domains was 0.70 for socioeconomic position and health, 0.76 for racial and ethnic health disparities, and 0.53 for access to health care.

PERCEIVED AND ACTUAL KNOWLEDGE OF UNDERSERVED POPULATIONS

Assessment of perceived knowledge of underserved population topics revealed that 14.0% of residents were very confident, 66.4% were somewhat confident, and 19.6% were not at all confident. Regarding the 3 major themes of perceived knowledge, 9.4% of residents were very confident with topics pertaining to health care access, 16.8% with topics pertaining to socioeconomic position, and 15.8% with topics pertaining to racial and ethnic health disparities. Average perceived knowledge scores were 40.1% for health care access, 52.1% for socioeconomic position, 49.6% for racial and ethnic health disparities, and 47.2% overall (item scale [0-1]: 0 = not knowledgeable; 0.5 = somewhat knowledgeable; 1 = very knowledgeable).

Assessment of actual knowledge revealed that the average percent correct for the entire sample, across all 30 questions, was 38.0%. Regarding the 3 major themes of actual knowledge, the percentage correct was 32.7% for health care access, 36.8% for socioeconomic position and health, and 43.8% for racial and ethnic health disparities (for complete response frequencies, see link to eAppendix 2 in Supporting Online Material at end of article).

Women scored better than men (average score, 12.16 [41%] vs 10.82 [36%]; $P=.01$), and African Americans scored higher than members of other racial/ethnic groups (average score, 13.04 [44%] vs 11.40 [38%]; $P=.04$; Table 1). Scores did not differ by age, year in training, parental income, or parental education level.

CONCORDANCE BETWEEN RESIDENTS' PERCEIVED AND ACTUAL KNOWLEDGE

Associations between residents' perceived and actual knowledge were generally high. In fact, there were positive associations between perceived and actual knowledge for all 3 main domains and overall. At the subdomain level, there was a positive association between actual and perceived knowledge across 5 of the 15 domains (health care availability, insurance status, mechanisms of socioeconomic position and health, health outcome discrepancies among ethnic groups, and racial stereotyping) (Table 2).

TABLE 2. Associations Between Resident Physicians' Actual and Perceived Knowledge of Underserved Population Topics

Domains and subdomains	Actual knowledge scores ^a (% correct)	Perceived knowledge scores ^b (%)	<i>P</i> value for independence between actual and perceived knowledge scores ^c
Access to health care			
Health care availability (ie, health care supply) by underserved	43.9	46.9	.002
Health care utilization (ie, use of health care) by underserved	46.0	44.5	.83
Access to health care for low-income nations	21.2	35.7	.80
Relationship between insurance status and health outcomes in the United States	41.0	40.1	<.001
Health care models that may enhance access to care	12.7	33.5	.59
Domain totals	32.7	40.1	.003
Socioeconomic position and health			
Relationship between income and health	23.2	57.4	.09
Relationship between health literacy and health	48.3	54.5	.09
Relationship between occupational level and health	32.7	49.3	.05
Mechanisms whereby socioeconomic position could affect health	47.4	53.2	.05
Environmental health and socioeconomic position	34.6	45.9	.94
Domain totals	36.9	52.1	.03
Racial and ethnic health disparities			
Health outcome discrepancies among different groups in the United States	45.9	50.6	<.001
Mechanisms for why racial and ethnic disparities exist	44.4	45.0	.11
Racial stereotyping and medical decision making	41.2	43.5	.04
Language barriers in health systems	40.7	61.0	.09
Health equity	50.2	47.7	.35
Domain totals	43.9	49.6	.02
Overall	37.8	47.2	.003

^a Average percent correct between 2 question items per subdomain across all 498 learners; item scale (0-1): 0 = both answers wrong; 0.5 = 1 answer wrong and 1 answer correct; 1 = both answers correct.

^b Average perceived knowledge for each domain across all 498 learners; item scale (0-1): 0 = not knowledgeable; 0.5 = somewhat knowledgeable; 1 = very knowledgeable. The percentage is derived by multiplying the scale score by 100.

^c Pearson correlation test of independence. Significant *P* value indicates an association between actual and perceived knowledge. All significant *P* values reflect a positive association (ie, higher perceived knowledge was associated with higher actual knowledge).

DISCUSSION

Inequity in health and health care are critical issues that will not likely be solved without adequate physician knowledge about underserved populations. This multi-institutional survey of a sample of US residents revealed that actual and perceived knowledge about most topics relating to underserved patient populations was low. These findings highlight the need for resident physician training on topics relevant to underserved patients and reveal specific areas that should be targeted by future curricula.

The low level of knowledge regarding topics relevant to underserved populations may reflect an educational system that has traditionally focused on cognitive and disease-based topics. Nevertheless, the trend has been to teach medical students and residents about how political, economic, and psychosocial factors affect patient health.^{3,15,20,21} Likewise, the Accreditation Council for Graduate Medical Education competency of systems-based practice³⁴ embraces the greater systems issues that influence health inequities; therefore, this may be an appropriate competency from which to assess resident knowledge of underserved populations. Consistent with this definition of systems-based

practice, physicians must understand the roles of health care and socioeconomic systems in tending to the underserved before they can advocate for underserved patients.³⁵ Indeed, the importance of residency training in these domains is highlighted by emerging interest among certifying organizations regarding knowledge and competency in underserved patient topics, including the recent creation of an Underserved Task Force by the American Board of Internal Medicine and the Association of Professors in Medicine.³⁶

Findings from our study reveal which physicians may be at greatest risk of having inadequate knowledge of underserved patients. First, women and African Americans demonstrate better knowledge of underserved patients. Indeed, research has shown that nonwhites are more likely to work among underserved populations than whites,³⁷ women demonstrate more favorable attitudes toward underserved populations than men,³⁸ and women and minority patients prefer sex- and race-concordant health care professionals, respectively.³⁹⁻⁴¹ In our study, 70% of respondents were not from minority groups, reflecting current medical student demographics (63% not from minority groups). Consistent with this, the Institute of Medicine has called for more minority health care professionals.⁴² Second, although we did not

find differences in knowledge among residents from more or less affluent families, this survey confirms that physicians in general are a privileged group with average parental income and education level well above the census average.^{43,44} This is consistent with surveys of matriculating US medical students, 60% of whom report coming from families with the top 20% of parental income.⁴⁵ This socioeconomic discordance between physicians and their patients may contribute to a lower level of knowledge about health issues among these populations. Therefore, curricula alone may not adequately improve physician knowledge of the underserved. Instead, service learning immersion experiences that involve working with underprivileged patients may be an effective way to bridge the disconnect between physicians-in-training and their underserved patient communities.⁴⁶

Our findings build on previous studies that show low confidence about underserved populations among nonresident physicians.⁴⁷ Resident physicians have reported that their understanding of health disparities and principles of culturally competent care is poor compared with their knowledge of other medical topics.¹ Compounding the issue of low confidence, resident physicians acknowledge dwindling concern for underserved patients as they progress through years of training.^{38,48} Our findings add to this literature by providing a new understanding of specific areas in which residents lack knowledge, namely the domains of health care access, socioeconomic position, and racial and ethnic disparities.

Despite a generally low level of knowledge of topics related to underserved populations, residents demonstrate concordance between perceived and actual knowledge across all 3 domains and overall. This finding suggests that, in contrast to many medical education topics,⁴⁹ physicians-in-training may be reasonably accurate in their self-assessment of knowledge regarding underserved populations, perhaps because they are more comfortable reporting a low level of knowledge on topics that fall outside the realm of traditional medical education. Residents with previous exposure in these areas, either through previous programs (eg, public health training) or through related curricula in medical school, may be comfortable expressing confidence in the knowledge gained from these experiences.

Our study has a number of limitations. Although this is a multi-institutional survey of residents from numerous training programs, internal medicine residents are disproportionately represented. Therefore, the results may not be generalizable to physicians in all training programs. However, the proportion of surgical (9.0%) vs nonsurgical residents in this study roughly approximates the 2009 residency match results, which revealed 12.4% surgical residents.⁵⁰ Nevertheless, the sample size discrepancy between specialties precludes meaningful knowledge comparisons between

surgical and nonsurgical specialties. Although the survey response rate might be suboptimal, the response rate is representative of physician surveys, which generally have lower response rates (about 52%-54% for larger physician surveys) than do surveys of the general population.^{51,52} Further, internal consistency reliability is optimal for socioeconomic position and health and racial or ethnic health disparities but not for access to health care. Therefore, the ability of questions to predict knowledge of this domain may be compromised. Finally, item difficulty analysis reveals that some of the survey items may have been too easy or too difficult, and confidently drawing conclusions about high- and low-scoring residents may require continued validation on larger samples. However, item discrimination analysis indicates that the items adequately classify learners with more vs less knowledge.

CONCLUSION

To our knowledge, this is the first multi-institutional survey to explore resident physicians' knowledge of underserved patients. We found that US resident physicians' knowledge of underserved patients is generally low, whereas the concordance between perceived and actual knowledge is generally high. The study findings should provide important information for developing postgraduate curricula regarding underserved populations.

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Supporting Online Material

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eAppendix 1
eAppendix 2