



# Effect of Spanish Language Immersion Rotations on Medical Student Spanish Fluency

Daniel S. Reuland, MD, MPH; Lisa M. Slatt, MEd; Marco A. Alemán, MD; Alicia Fernandez, MD; Darren DeWalt, MD, MPH

**BACKGROUND AND OBJECTIVES:** The study's objective was to determine whether participation in an international health rotation in a Spanish-speaking country (immersion) is associated with improved Spanish fluency compared to participation in domestic medical Spanish coursework alone.

**METHODS:** Participants matriculated at one US medical school in the years 2004–2008. At matriculation (baseline), all had intermediate to advanced Spanish fluency based on a standardized, oral fluency test. All took didactic coursework in years 1 and 2 of medical school. Some elected to participate in a post-year 1 immersion rotation in a Spanish-speaking Latin American country. Oral fluency was reassessed using the same method in years 2 and 4 by independent evaluators who were blind to individuals' participation status and prior fluency scores. The authors compared participants' likelihood of demonstrating greater Spanish fluency over baseline among those who did post-year 1 immersion versus those who did US-based coursework alone (controls).

**RESULTS:** The likelihood of having greater Spanish fluency at the second-year assessment was 80% (45/56) among immersion participants, compared with 46% (21/46) for controls. The likelihood of having increased fluency at the fourth-year assessment was 65% (13/20) among those who did immersion versus 28% (7/25) for controls. Odds of having improved fluency for immersion participants remained statistically significantly higher after adjusting for baseline fluency (AOR [95%CI]=4.3 [1.7, 10.6], at year 2 and 5.1 [1.2, 21.6], at year 4).

**CONCLUSIONS:** Among medical students with intermediate to advanced baseline Spanish fluency, participants in a post-year 1 Spanish language international health immersion rotation were more likely to improve their Spanish fluency than participants in US-based coursework alone.

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lower rates of cancer screening,<sup>1,3-5</sup> and worse control of diabetes and cardiovascular risk factors compared with non-LEP populations.<sup>6,8-10</sup>

Overcoming language barriers in health care will require health care system adaptation at multiple levels. Greater availability and better integration of trained interpreters into clinical processes are needed. In addition, growing evidence suggests that patients with LEP benefit from receiving language concordant care, ie, care by a provider who speaks their language.<sup>1,11-16</sup> Experts have recommended expanding the Spanish-speaking provider workforce in the United States by recruiting more bilingual Latino health care providers and/or through training via appropriate curriculum in medical school or residency.<sup>6,12,17,18</sup> Although medical educators have begun to seek ways to enhance Spanish language proficiency and related cultural skills of medical students and residents,<sup>19-22</sup> our understanding of how best to accomplish this is limited.

For US medical students with appropriate baseline Spanish language skills, participation in an international health rotation in a

**M**ore than 31 million US residents, one in 10, speak Spanish at home, and more than half this population has limited English proficiency (LEP). Language

barriers contribute to disparities in health and health care for populations with LEP. LEP populations have lower visit content comprehension,<sup>1</sup> lower patient satisfaction,<sup>2</sup>

From the Department of Medicine (Drs Reuland, Alemán, and DeWalt) and Department of Family Medicine (Ms Slatt), University of North Carolina, Chapel Hill; and Department of Medicine, University of California, San Francisco (Dr Fernandez).

Spanish-speaking country may offer, among other learning opportunities, a means of maintaining or enhancing Spanish language fluency. While international health rotations among North American medical students and residents are increasingly popular,<sup>23,24</sup> studies to date that have examined the educational benefits of international rotations have either (1) relied primarily on student self-report of improvement in skills using unvalidated outcome measures and/or (2) lacked suitable comparison groups.<sup>25-27</sup> To our knowledge, no studies have examined the relationship between medical trainee participation in international Spanish language immersion rotations (hereafter referred to as immersion) and improvement in language skills. Empiric evidence in this area would be useful to educators, as it would help inform decisions regarding how and if to allocate resources to curricular programs designed to encourage or formalize such activity. Evidence would be particularly compelling if immersion was shown to yield additional benefits when added to domestic language curriculum and that such benefits were durable beyond the initial weeks or months following the immersion activity.

In this study, we retrospectively examined data from a longitudinal “medical Spanish” program to test the hypothesis that students who participate in an immersion rotation in addition to taking US-based medical Spanish coursework are more likely to improve their Spanish fluency compared with those who participate in coursework alone.

## Methods

### *Participants and Timeline*

The study was approved by the University of North Carolina, Chapel Hill Institutional Review Board. All students who matriculated at this institution during the study years 2004 through 2008 received a letter describing the program and inviting interested individuals who assessed their own Spanish fluency as intermediate or advanced to apply.<sup>19</sup> The

application process included taking a standardized oral fluency test, described below. Accepted participants were non-native speakers, who demonstrated intermediate to advanced Spanish fluency based on this test. A detailed program description has been published elsewhere,<sup>19</sup> but in brief, all program students participated in core medical Spanish coursework in the first 2 years of medical school. Course activities included for-credit didactic teaching in conducting clinical encounters in Spanish, “cultural” and experiential learning activities that included community service, guided practice using bilingual standardized patients, and feedback from bilingual faculty based on observed encounters.

### *Measures*

**Fluency Assessments.** Spanish fluency was assessed using the Spoken Language Evaluation™ (SLE), a standardized oral fluency test administered by a commercial language testing service.<sup>28</sup> The test has been described previously,<sup>29</sup> but consists of a structured telephone interview during which an examiner provides a series of 12 items or “prompts” in Spanish. Items are randomly chosen from a larger pool, a process that ensures different test content even when the assessment is re-administered to the same individual over time. The prompts require the candidate to express themselves verbally in Spanish in both general conversational domains as well as in basic health domains. Sample item (in Spanish): “If you had a friend who smoked two packs of cigarettes a day, what advice would you give him?” Telephone interviews were audiorecorded and reviewed independently by evaluators who rated the domains of vocabulary, speed, grammar, sentence structure, and ability to express ideas in Spanish. Evaluators are first-language, or “native,” Spanish speakers educated at least through university level in a Spanish-speaking country and undergo training and periodic internal calibration to maintain

inter-rater reliability of more than >0.8.<sup>29,30</sup> Evaluators were blind to participants’ prior scores and their immersion participation status. The test was scored on a 12-point scale, and all study participants had scores that ranged from 6 (low intermediate fluency) to 10 (advanced fluency) at the time of matriculation into the medical school. Participants underwent a repeat assessment early in the second year and again in their fourth year of medical school, shortly before graduation.

**Immersion.** Participation in a post-year 1 international immersion rotation was optional, ie, students chose whether or not they wanted to participate. Most immersion rotations took place in Mexico, Nicaragua, Honduras, and Peru where faculty from the medical school have ongoing clinical or research relationships. The experiences typically lasted 4–6 weeks, (mean=5.5, SD=1.9, range=2–9 weeks) and were arranged independently by students. Students generally participated at their own expense, and most received elective credit. The educational program provided modest travel stipends (~\$400) to immersion participants in years 2004–2006. Some also applied for and received intramural research stipends if their immersion rotation involved research.

**Statistical Analysis:** Our primary outcome (dependent) variable was whether or not a participant’s fluency score was at least 1 point higher at year 2 compared to his/her baseline. Our predictor (independent) variable of interest was participation in immersion rotation. We compared the probabilities of achieving improved fluency between the two student groups, ie, immersion plus coursework versus coursework alone, using a chi square test. We constructed logistic regression models that included participants’ baseline fluency level as a covariate since prior work has suggested that participants with very high baseline fluency may be less

likely to demonstrate an improvement, i.e. ceiling effects.<sup>19</sup> We also examined whether including variables such as sex, race, age, childhood language spoken at home, and college Spanish curriculum (major or minor in Spanish) in the models influenced the association between immersion and increased fluency. We performed a similar analysis for our secondary endpoint, fluency improvement at year 4. This latter analysis was performed on the subset of students from the 2004–2006 matriculating cohorts for whom we had year 4 data as of this writing. We performed comparable analyses treating year 2 and year 4 fluency change scores as continuous rather than categorical variables. We did this by comparing average fluency change scores for students who did and did not do immersion using a *t* test. As with the categorical analysis above, we subsequently used linear regression modeling to control for each participant's baseline fluency and determine the influence of other covariates. Statistical analyses were conducted using Stata (2009, Release 11. Statistical Software, College Station, TX: StataCorp LP).

## Results

A total of 106 students were eligible for this study (Table 1), representing 13% of all students matriculating at the institution during the 5 study years. The mean (range) number of enrollees per year was 21.2 (19–25). Overall, participants were similar in terms of age, race, and gender to medical students at our institution and nationally.<sup>23</sup> Thirty-nine percent had majored or minored in Spanish prior to medical school. Immersion participants had modestly lower mean baseline fluency scores than non-immersion participants, were more likely to be women, and were slightly younger on average.

### Likelihood of Improved Spanish Fluency at Year 2 and Year 4.

We had primary outcome data (year 2 fluency assessments) for 102 (96%) of the 106 eligible students (Table 2). Of the 56 students who participated in immersion, 45 (80%) had increased fluency scores compared with their baseline; among the 46 participants who did not do immersion, 21 (46%) increased their fluency ( $P<.001$  for difference). Among

participants for whom year 4 fluency data were available, 13/20 (65%) of those who did immersion demonstrated increased fluency compared with their baseline versus 7/25 (28%) of those doing domestic coursework alone ( $P<.016$  for difference). In logistic regression models that adjusted for baseline fluency, immersion participants had greater odds of improving their fluency compared with no immersion at year 2 (AOR [95%CI], 4.9 [2.0, 11.7]) and year 4 (AOR [95%CI], 4.8 [1.2, 21.6]). When baseline fluency, age, race, sex, and being a college Spanish major/minor were included in the model, even greater adjusted odds ratios were obtained (data not shown). Among our covariates only baseline fluency and participation in an immersion rotation were significant independent predictors of having greater fluency at years 2 and 4. Among those participating in immersion, we found no significant association between length of immersion and fluency improvement (data not shown).

### Comparison of Mean Fluency Score Changes (Table 3).

When we treated change in fluency score as a continuous rather than categorical variable, immersion participants demonstrated a larger mean increase in Spanish fluency compared with those who did coursework alone in an unadjusted comparison (difference [95%CI]: 0.8 [0.4, 1.3],  $P=.0002$ ). After adjusting for baseline fluency, the difference between immersion and coursework alone groups was somewhat attenuated, though it remained statistically significant [difference (95%CI): 0.6 (0.3, 1.1),  $P=.001$ ]. Among the 45 students for whom year 4 data were available, immersion participants had a greater mean increase in Spanish fluency compared with those who did course work alone [unadjusted difference (95%CI)=0.9 [0.2, 1.7],  $P=.036$ ]. This difference between immersion and no immersion groups was somewhat attenuated after adjustment for baseline fluency but remained “borderline” statistically significant

**Table 1: Characteristics of Students Participating in Medical Spanish Program at One US Medical School (Data Collected From Students Matriculating in Years 2004–2008)**

	Immersion Plus Coursework (n=56)	Coursework Alone (n=50)	Combined (n=106)
Age, years Mean (SD)	23.3 (2.1)	25.5 (4.7)	24.3 (3.7)
White	44 (79%)	45 (90%)	89 (84%)
African American	5 (9%)	2 (4%)	7 (7%)
Asian	6 (11%)	3 (6%)	9 (8%)
Other	1 (2%)	0 (0%)	1 (1%)
Spanish spoken in home as child	0 (0%)	3 (7%)	3 (3%)
Women	39 (69%)	25 (50%)	64 (60%)
College Spanish major or minor	19 (38%)	18 (41%)	36 (39%)
Mean baseline fluency (range)	8.5 (6–10)	8.8 (6–10)	8.6 (6–10)

Unless otherwise specified, numbers in cells represent number of subjects; within-column percentages are shown in parentheses. Percentages may not sum to 100% due to rounding.

SD—standard deviation

**Table 2: Likelihood of Demonstrating Greater Oral Spanish Fluency Compared With Baseline Among Medical Students According to Participation in a Year 1 International Spanish Language Immersion Rotation**

	Immersion Plus Coursework	Coursework Alone	P Value	OR (95%CI) AOR (95%CI)*	P Value
Greater fluency at year 2 (n=102)	45/56 (80%)	21/46 (46%)	<.001	4.9 (2.0,11.7) 4.3 (1.7, 10.6)*	<.001 <.001
Greater fluency at year 4 (n=45)	13/20 (65%)	7/25 (28%)	.013	4.8 (1.3, 16.9) 5.1 (1.2, 21.6)*	.016 .026

OR—crude odds ratio, CI—confidence interval, AOR—adjusted odds ratio

\* Adjusted for baseline Spanish fluency.

(difference [95%CI]=0.60 [0.0, 1.2],  $P=.057$ ). Adding other covariates including age, sex, and majoring/minoring in Spanish in college did not change the relationship between immersion participation and greater Spanish fluency at either year 2 or year 4.

## Discussion

We found that, among medical students with intermediate to advanced Spanish fluency at matriculation, those who participated in a post-year 1 international Spanish language immersion rotation along with medical Spanish coursework during the first 2 years of medical school were subsequently more likely to demonstrate improved Spanish fluency compared with those who participated in US-based coursework alone. Although these findings are consistent with the anecdotal experiences of learners and educators who have participated in such rotations, to our knowledge, this study is the first to provide empiric evidence of the effect of international rotations on language fluency.

Our study is strengthened by the use of longitudinal data collection, the presence of a comparable control group, the ability to control for baseline skill level (fluency), and the independent and blind nature of the fluency assessments, which adds objectivity to a body of literature that

has relied largely on learners' self-reports of enhanced knowledge and skills.<sup>31-34</sup> The finding that the apparent benefits of immersion on Spanish fluency were still present in the final semester of medical school, more than 2 years following the immersion activity, makes the results more compelling, since it suggests that the favorable effects of immersion on fluency persist beyond the initial weeks or months after the experience.

Our study adds to a growing, but methodologically limited, body of evidence regarding the educational value of international health rotations. Indeed, a recent systematic review from 2011 on this topic found only 11 studies that met their inclusion criteria and that most of these studies have either utilized only self-administered questionnaires for assessing IHEs' impacts or lacked control groups or used comparison groups that were not directly comparable to program participants, suggesting substantial selection bias.<sup>25</sup> In a previous systematic review (2003) of the effects of "cross-cultural" experiences, investigators Mutchnik et al concluded that the evidence regarding cross-cultural experiences for medical students "falls short of demonstrating a clear benefit to participating in a cross-cultural experience over not participating" and suggested that future research should also include "clearly defined

outcomes that are directly attributable to participating in a cross-cultural experience."<sup>35</sup> Likewise, another systematic review of the educational effects of international health electives (IHEs) also found similar methodologic weaknesses, leading authors Thomson et al to remark that "student and resident enthusiasm for these electives has not been matched by medical educator's interest (or ability) to evaluate IHEs with more rigorous studies."<sup>27</sup> In fact, the only study identified by these reviews that used a knowledge or skill-based outcome that was not based on self-report had a non-comparable control group. Specifically, the study found that students accepted to a competitive international fellowship later scored better on public health portions of a national board examination than did students who had been rejected from the program.<sup>26</sup> Clearly, the risk of bias introduced by using such a comparison group is high given the likelihood that the comparison groups had different baseline aptitudes for the outcome in question. Viewed in this context, our study provides both an objective outcome measure and suitably matched comparison group.

This study adds to the larger dialogue regarding whether, how, and to what ends should educational institutions in developed countries commit resources toward student participation in international health activities in less-developed countries, an educational activity that has been increasingly popular among learners.<sup>23</sup> We estimate that students spent roughly \$2,000–\$2,500 to participate in an immersion rotation. Costs can be influenced by many factors, including in-home stays, participation in in-country formal programs, and language courses. These students generally arranged independent rotations that were linked to existing international collaborations between our institution and clinical or research partner organizations in Latin America. Our findings may be of particular interest to

medical educators who are considering whether to establish or strengthen collaborative relationships with clinical and research sites in Spanish-speaking countries.

This study can be viewed in the context of broader trends in medical education. First, as the US population becomes more linguistically diverse, medical educators need to consider how medical student recruitment and training should be modified to prepare a physician workforce that can meet the population's needs and can address disparities associated with language barriers. Emerging evidence that language concordance between clinician and patient may mitigate health disparities associated with language barriers suggests that educational leaders should consider what steps their institution should take toward contributing to the linguistic capabilities of the physician workforce.<sup>1,12-16</sup> These steps should not supplant training in use of interpreters, which is also essential in a linguistically diverse country. Certainly, North American medical schools should intensify efforts to recruit and enroll more Latino students who are also fluent Spanish speakers to increase the number of clinicians who can provide both linguistically and culturally concordant

care for LEP Latino patient populations. However, the proportion of students applying to, graduating from, or scheduled to graduate from US medical schools from 2007 through 2011 who report that Spanish is their first language is less than 2% and is not increasing.<sup>36</sup> Hence, it is likely that the supply of US-educated bilingual physicians who are Latino/Hispanic will continue to be small relative to the numbers of patients accessing care whose language preference (or requirement) is Spanish, at least for the foreseeable future. This suggests that strategies to bolster the Spanish-capable workforce should also include cautious and responsible efforts to promote, through recruitment and curricular efforts, Spanish fluency among trainees for whom Spanish is not their first language, since this represents another potentially large source of Spanish-capable clinicians. While national data on the Spanish capabilities of matriculating medical students are not available, data from this medical school suggest that in addition to the 1%–2% who are “native” speakers, roughly 10% of matriculants have “advanced” or higher fluency, and an additional 20% fall into the “intermediate” fluency range.<sup>29</sup> While appropriate concerns have been raised about who is a qualified bilingual

provider,<sup>10,17,37,38</sup> medical educators and researchers should continue to seek ways to identify learners who have interests and backgrounds that make them appropriate participants for this kind of activity.<sup>19-22</sup>

Our study has some limitations. First, it is possible that the observed association between the international health immersion experience and improved Spanish fluency is at least partly attributable to an unmeasured underlying difference between participants who did and did not choose to do international health immersion rotations. Nevertheless, since both the immersion and non-immersion comparison group had also applied for and been accepted into the same medical Spanish program and had taken the same US-based medical Spanish coursework, the groups were apparently similar in their capability and motivation with respect to improving their Spanish fluency. Further, our modeling suggests that the effect of immersion on fluency persisted even after controlling for variables such as sex, age, premedical Spanish language experiences, and baseline fluency. A second limitation is that, while Spanish fluency is an increasingly important skill for US clinicians, our study does not address the possible acquisition of other knowledge, skills,

**Table 3. Changes in Spanish Fluency Scores Among Medical Students According to Participation in Year 1 International Spanish Language Immersion Rotation**

	Immersion Plus Coursework	Coursework Alone	Difference (Adjusted Difference‡)	P Value†
Mean baseline fluency score (n=102)	8.5 (8.2, 8.8) (n=56)	8.9 (8.6, 9.2) (n=46)		
Mean score at year 2	9.6 (9.3, 10.0)	9.2 (8.9, 9.6)		
Mean change at year 2	+1.2 (0.9, 1.4)*	+0.3 (0.0, 0.7)	0.8 (0.4, 1.3) (0.7 [0.3, 1.1])	.0002 .002
Mean score at year 4 (n=45)	9.4 (8.8, 9.9) (n=20)	8.9 (8.5, 9.4) (n=25)		
Mean change at year 4	+0.9 (0.3, 1.5)	+0.0 (-0.4, 0.5)	0.9 (0.1, 1.5) (0.6 [0.0, 1.2])	.036 .057

Scores are shown as mean (95%CI). Baseline scores are shown for 102 participants who had year 2 data available.

\* Discrepancies in row and column sums due to rounding.

† Test for difference between immersion and coursework alone groups (t test).

‡ Results in brackets adjusted for baseline fluency.

and attitudes such as cultural competence or ability to effectively care for patients from cultures different to one's own. The degree to which linguistic skill is associated with less well-defined concepts of cultural competence is not known, nor is the importance of cultural concordance between a clinician and patient as distinct from language concordance known.<sup>39</sup> A third potential limitation is that the clinical significance of the improved fluency we found in this study is not known. Indeed, little is known about the relationship between measured Spanish fluency and ability to communicate effectively in clinical settings.<sup>37</sup> Nonetheless, the fact that immersion participants were more likely to demonstrate a degree of fluency improvement that is reliably discernable by a blinded "native"-level Spanish speaker does suggest that such an improvement is, at some level, meaningful in terms of overall communication quality. Further, the true clinical significance of improvement in a specific skill or competency attributable to a given educational activity is often not known. Perhaps the more important question is: How fluent is fluent enough? Or more specifically, absent a sufficient workforce of completely bilingual/bicultural clinicians to care for LEP patients, what level of fluency, in what contexts, and for which outcomes is language concordant care as good or better than care provided using trained interpreters? Future studies that include assessments of fluency, whether measured, patient reported,<sup>39</sup> or clinician/trainee reported,<sup>29</sup> will help to clarify relationships between fluency, clinical communication quality, and outcomes.

In summary, our findings suggest that an immersion rotation in a Spanish-speaking Latin American country is likely to offer sustained improvement in Spanish fluency of medical students and may represent an opportunity for qualified trainees to solidify or enhance their Spanish language skills. We believe

these findings will add to the body of evidence needed to inform educators and educational leaders as they consider whether and how to allocate educational resources to international health rotations both in general and in Latin America in particular.

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**CORRESPONDING AUTHOR:** Address correspondence to Dr Reuland, University of North Carolina at Chapel Hill, Cecil G. Sheps Center for Health Services Research, 725 Martin Luther King Jr. Blvd, Campus Box 7590, Chapel Hill, NC 27599-7590. dreuland@med.unc.edu.

## References

- Wilson E, Chen AH, Grumbach K, Wang F, Fernandez A. Effects of limited English proficiency and physician language on health care comprehension. *J Gen Intern Med* 2005;20(9):800-6.
- Morales LS, Cunningham WE, Brown JA, Liu H, Hays RD. Are Latinos less satisfied with communication by health care providers? *J Gen Intern Med* 1999;14(7):409-17.
- Diaz JA, Roberts MB, Goldman RE, Weitzen S, Eaton CB. Effect of language on colorectal cancer screening among Latinos and non-Latinos. *Cancer Epidemiol Biomarkers Prev* 2008;17(8):2169-73.
- Woloshin S, Schwartz LM, Katz SJ, Welch HG. Is language a barrier to the use of preventive services? *J Gen Intern Med* 1997;12(8):472-7.
- Harlan LC, Bernstein AB, Kessler LG. Cervical cancer screening: who is not screened and why? *Am J Public Health* 1991;81(7):885-90.
- Perez-Stable EJ, Naples-Springer A, Miramontes JM. The effects of ethnicity and language on medical outcomes of patients with hypertension or diabetes. *Med Care* 1997;35(12):1212-9.
- Eamranond PP, Legedza AT, Diez-Roux AV, et al. Association between language and risk factor levels among Hispanic adults with hypertension, hypercholesterolemia, or diabetes. *Am Heart J* 2009;157(1):53-9.
- Eamranond PP, Patel KV, Legedza AT, Marcantonio ER, Leveille SG. The association of language with prevalence of undiagnosed hypertension among older Mexican Americans. *Ethn Dis* 2007;17(4):699-706.
- Schenker Y, Lo B, Ettinger KM, Fernandez A. Navigating language barriers under difficult circumstances. *Ann Intern Med* 2008;149(4):264-9.
- Diamond L, Schenker Y, Curry L, Bradley E, Fernandez A. Getting by: under use of interpreters by resident physicians. Abstract in supplement to *J Gen Intern Med* 2008;23 (suppl 2) April.
- Gonzalez HM, Vega WA, Tarraf W. Health care quality perceptions among foreign-born Latinos and the importance of speaking the same language. *J Am Board Fam Med* 2010;23(6):745-52.
- Schenker Y, Karter AJ, Schillinger D, et al. The impact of limited English proficiency and physician language concordance on reports of clinical interactions among patients with diabetes: The DISTANCE study. *Patient Educ Couns* 2010;Mar 9.
- Eamranond PP, Davis RB, Phillips RS, Wec CC. Patient-physician language concordance and lifestyle counseling among Spanish-speaking patients. *J Immigr Minor Health* 2009;11(6):494-8.
- Alexander RG, Quyen N-M, Anna TRL, Michael PM, Russell SP, Lisa II. Interpreter services, language concordance, and health care quality. *J Gen Intern Med* 2005;20(11):1050-6.
- Baker DW, Hayes R, Fortier JP. Interpreter use and satisfaction with interpersonal aspects of care for Spanish-speaking patients. *Med Care* 1998;36(10):1461-70.
- Ngo-Metzger Q, Sorkin D, Phillips R, et al. Providing high-quality care for limited English proficient patients: the importance of language concordance and interpreter use. *J Gen Intern Med* 2007;22:324-30.
- Flores G, Mendoza FS. Dolor aqui? Fiebre?: a little knowledge requires caution. *Arch Pediatr Adolesc Med* 2002;156(7):638-40.
- Silberman P, Bazan-Manson A, Purves H, et al. North Carolina Latino health, 2003. A report from the Latino Health Task Force. *N C Med J* 2003;64(3):113-21.
- Reuland DS, Frasier PY, Slatt LM, Aleman MA. A longitudinal medical Spanish program at one US medical school. *J Gen Intern Med* 2008;23(7):1033-7.
- Mazor SS, Hampers LC, Chande VT, Krug SE. Teaching Spanish to pediatric emergency physicians: effects on patient satisfaction. *Arch Pediatr Adolesc Med* 2002;156(7):693-5.
- Prince D, Nelson M. Teaching Spanish to emergency medicine residents. *Acad Emerg Med* 1995;2(1):32-6; discussion 36-7.
- Nora LM, Daugherty SR, Mattis-Peterson A, Stevenson L, Goodman LJ. Improving cross-cultural skills of medical students through medical school-community partnerships. *West J Med* 1994;161(2):144-7.
- Association of American Medical Colleges: GQ Program Evaluation Survey. All Schools Summary Report Final. Washington, DC, 2010.
- Dodard M, Vulcain A, Fournier A. Project Medishare: a volunteer program in international health at the University of Miami. *Acad Med* 2000;75(4):397-401.

25. Jeffrey J, Dumont RA, Kim GY, Kuo T. Effects of international health electives on medical student learning and career choice: results of a systematic literature review. *Fam Med* 2011;43(1):21-8.
26. Waddell WH, Kelley PR, Suter E, Levit EJ. Effectiveness of an international health elective as measured by NBME Part II. *J Med Educ* 1976;51(6):468-72.
27. Thompson MJ, Huntington MK, Hunt DD, Pinsky LE, Brodie JJ. Educational effects of international health electives on US and Canadian medical students and residents: a literature review. *Acad Med* 2003;78(3):342-7.
28. ALTA Language Services Inc. Spoken Language Evaluation (SLE)<sup>TM</sup>. <http://www.altalang.com/>. Accessed February 28, 2011.
29. Reuland DS, Frasier PY, Olson MD, Slatt LM, Aleman MA, Fernandez A. Accuracy of self-assessed Spanish fluency in medical students. *Teach Learn Med* 2009;21(4):305-9.
30. ALTA Language Services, Inc. <http://www.altalang.com/language-testing/>. Accessed February 28, 2011.
31. Margolis CZ, Deckelbaum RJ, Henkin Y, Baram S, Cooper P, Alkan ML. A medical school for international health run by international partners. *Acad Med* 2004;79(8):744-51.
32. Dowell A, Crampton P, Parkin C. The first sunrise: an experience of cultural immersion and community health needs assessment by undergraduate medical students in New Zealand. *Med Educ* 2001;35(3):242-9.
33. Esfandiari A, Drew CR, Wilkerson L, Gill G, Drew CR. An international health/tropical medicine elective. *Acad Med* 2001;76(5):516.
34. Jotkowitz AB, Gaaserud A, Gidron Y, Urkin J, Margolis CZ, Henkin Y. Evaluation of student attitudes and knowledge in a new program in international health and medicine. *Med Teach* 2004;26(6):574-6.
35. Mutchnick IS, Moyer CA, Stern DT. Expanding the boundaries of medical education: evidence for cross-cultural exchanges. *Acad Med* 2003;78(10 Suppl):S1-S5.
36. Matriculating Student Questionnaire, administered by the Association of American Medical Colleges. Available at <http://www.aamc.org/data/msq/start.htm>. Accessed April 30, 2008.
37. Diamond LC, Reuland DS. Describing physician language fluency: deconstructing medical Spanish. *JAMA* 2009;301(4):426-8.
38. Ferguson W. Un Poquito. *Health Aff* 2008;27:6.
39. Fernandez A, Schillinger D, Grumbach K, et al. Physician language ability and cultural competence. An exploratory study of communication with Spanish-speaking patients. *J Gen Intern Med* 2004;19(2):167-74.