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The editors of MSRJ are excited to announce our Winter 2015 issue. As always, we were incredibly impressed by the caliber of submissions. This issue includes interesting articles written by medical students from UC Davis College of Medicine and Michigan State University College of Human Medicine.

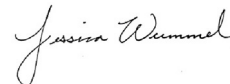
Since the release of our last issue, we have been astounded by the number of submissions received. We are always honored when medical students choose our journal to showcase their work, and we are very thankful to all of our authors. Because we want to ensure prompt publications to our authors, we have made the decision to modify our submission and publishing process. The changes are as follows: removal of submission deadlines, implementation of rolling submissions, and starting an e-publication process. What does this mean? Manuscripts submitted to our journal will be reviewed in the order in which they are received, —as has always been our policy. However, now, they will be electronically published as soon as they are ready. These online publications will then be combined into a full issue at our normal publication dates. We believe this will allow articles that are polished when submitted to go through the process more quickly and prevent articles that may need more time in the reviewing/editing process from holding up any particular issue. We hope that this solution will satisfy our authors and provide our readers with a steadier stream of articles to enjoy.

As this issue goes to print, our annual Spring student elective has come to a close. We hold this student elective every year to cater to students interested in being part of the MSRJ editorial staff and for those who wish to familiarize with the reviewing and publishing process. The elective continues to grow in popularity and we are always excited to meet a new group of students interested in the MSRJ. This year, we were impressed with all those who completed the course, many of whom will be joining our editorial staff for the upcoming year.

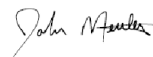
In addition, we will be making the transition to our new executive leadership staff within the coming month. Jessica Wummel and Jack Mettler will be graduating this year and moving on to residency. They were honored to serve as Executive Editors for the past year and will continue to be involved in MSRJ as much as they can. Jessica will be moving on to complete a residency in medicine/pediatrics at the University of Michigan, and Jack will be starting his residency in radiology at Beaumont Hospital in Royal Oak, Michigan. Kailyn Vitale, an incoming fourth year, has been elected as the new Executive Editor-In-Chief and James Polega, an incoming third year, and Rama Salhi, an incoming fourth year, have been elected as Executive Editors. We are very excited for these outstanding students to take over leadership of the journal. They have shown tremendous commitment over the years in working with MSRJ and we cannot wait to see where they take the journal.

As always, we would like to thank the Michigan State University College of Human Medicine for their continued support. In addition, we would like to acknowledge the hard work of our talented staff; without them, this journal's success would not be possible. We hope that our readers will continue to follow the progress of the MSRJ both on Facebook and Twitter, and on our website at <http://www.MSRJ.org>. Please continue to send your manuscripts to us; we welcome reading all of the amazing work from our fellow colleagues.

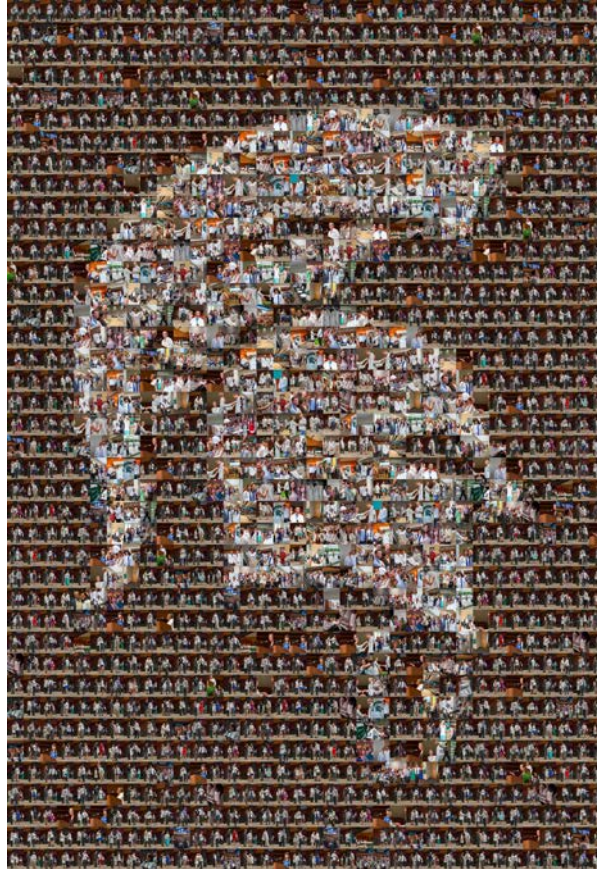
Sincerely,



Jessica Wummel
Executive Editor – MSRJ 2014–2015



Jack Mettler
Executive Editor – MSRJ 2014–2015



White Coat Sparty

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Professional responsibility, compassion, honesty, respect for others, competence, and social responsibility are the characteristics that the Michigan State University College of Human Medicine strives to instill in every student. The characteristics that the college aims to imprint on the student population are extraordinarily evident in the faculty. For instance, my pregnant wife recently had blood work done that came back as high risk for Angelman syndrome. I emailed the genetics professor that night and by the time I woke the next morning I had two emails from her. She was compassionate; she reassured me in my time of need. She was open and honest; she spoke frankly about the

situation and what would be involved. She showed respect for me; she took time out of her schedule to address my concerns. She showed competence; she not only discussed follow-up procedures but actually contacted a geneticist working for the company who performed the test so that she could best serve our needs. She showed both professional and social responsibility; she used her expertise as a doctor and her position as a teacher to encourage and help a member of her community. With such role models it is inevitable that CHM graduates will embody these ideals.

These ideals are represented by two iconic symbols in our college. These symbols are the 'Clinical Sparty'

logo and our white coats. The Clinical Sparty logo is a Spartan helmet that prominently features a stethoscope. This image shows not only our school's pride in its Spartan heritage but its pride in its Spartan physicians. The white coat represents the years of hard work each and every incoming medical student has put forth to get to this point in our lives. It is a badge of honor, signifying our place in not only a profession but also a family of medical personnel across the world. For this project I decided to bring these two icons together into a single display. With permission from the college, I utilized photographs from the 2014 White Coat Ceremony and the Clinical Sparty logo to make a photo mosaic of the logo.

This project was not only meant to highlight the previously mentioned ideals, but also to highlight other aspects of our education and future professional careers. To me, the most important aspect of this project is the representation of so many people, of different ages, genders, ethnicities, religions, sexual identities

and backgrounds coming together to form one cohesive whole. The diversity and inclusion present in these individuals, working together to become doctors, is amazing and inspiring. The fact that this collage would not look like the Spartan logo without each and every physician, faculty member, mentor and student in the picture hammers this point home. Of the limited training we have had as first-year medical students, a very significant portion has been dedicated to cultural sensitivity. We have learned through empathy, acceptance and understanding that we have the ability to treat every patient in a way that they desire. It is amazing to me that the many cultures and beliefs represented by my classmates will ultimately mesh to provide positive care for an even more diverse patient population. I hope that I have captured this diversity and have shown in some small way that despite our differences we form something so much bigger and better than our individual selves when we work together.

***In Situ* Thrombosis of the Pulmonary Arteries: An Emerging New Perspective on Pulmonary Embolism**

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Keywords: *pulmonary embolism; in situ pulmonary artery thrombosis; deep vein thrombosis (DVT); pulmonary circulation; Virchow's triad*

INTRODUCTION

The annual incidence of pulmonary embolism (PE) in the United States is reported to be 0.69 per 1,000 persons with mortality of up to 30% depending upon the size of the emboli.¹ PE and deep venous thrombosis (DVT) are both considered manifestations of the same disease of venous thromboembolism. Virchow postulated that dysfunction of vessel walls, alternations in blood flow and hypercoagulability of the blood triggered inappropriate thrombus formation.² DVT most commonly occurs as local clot formation in the deep calf veins. PE arises when clots break off from a peripheral DVT and become lodged within the pulmonary arterial vasculature. PE is routinely diagnosed when filling defects are found in the pulmonary arteries on computed tomography angiogram (CTA). Among the general population of patients presenting to emergency rooms, absence of DVT may occur in up to 57% of those diagnosed with PE.³ A high prevalence of isolated PE may suggest localized thrombus formation in the pulmonary arteries instead of embolization from peripheral clots. *In situ* thrombosis is not differentiated from emboli on CTA. However, despite evidence for multiple possible origins for clots within the pulmonary arteries, PE is the default diagnosis for filling defects detected by CTA in clinical practice.⁴ The goal of this article is to present a new model suggesting that a subset of what is currently labeled as PE is actually a localized thrombus within the pulmonary arteries. We review the following topics: (1) the unique features of the lung vasculature that contribute to hemostasis, (2) disruption of hemostasis and localized pulmonary

artery thrombosis, (3) a possible role for inflammation in thrombosis, (4) clinical implications of *in situ* pulmonary artery thrombosis, and (5) future directions for research.

HEMOSTASIS IN THE PULMONARY ARTERIES

The pulmonary circulation is a uniquely fibrinolytic environment. Expression of mediators of fibrinolysis are increased in pulmonary arteries when compared to peripheral veins in response to an inflammatory stimulus.⁵ Blood fluidity in the pulmonary arteries and their branches is promoted by a high ratio of tissue plasminogen activator (t-PA) to plasminogen activator-inhibitor 1 (PAI-1) and endogenous heparin-like proteoglycans that provide a non-thrombogenic surface in the vasculature endothelium.^{6,7} One model suggests that the pulmonary vascular system is ideally suited to be a mechanical sieve for venous drainage from the body. With the ubiquitous nature of spiral CT angiography, an increasing incidence of incidental isolated small PEs has been reported.⁸ These small clots may represent the critical role of the pulmonary vasculature in filtering out small emboli from the systemic circulation, which subsequently undergo fibrinolysis.⁹ If the pulmonary vasculature is highly fibrinolytic, how can localized thrombosis occur within the pulmonary arteries?

MECHANISMS OF THROMBUS FORMATION

Systemically, clotting occurs when initiated by a stimulus, which transforms tissue factor from an encrypted FVII cell membrane receptor to a functional receptor.¹⁰ Injury to endothelial cells from trauma, ischemia, inflammation,

or activation of the complement system exposes tissue factor receptor activity. Disruptions to endothelial cell mechanisms that maintain blood fluidity in the pulmonary vasculature may result in localized thrombus formation. Localized thrombosis is the most common type of thrombosis and has been documented throughout the body including cerebral, retinal, upper and lower extremity, and abdominal veins.¹¹ Case studies have described *in situ* pulmonary artery thrombosis in patients who have disruption of hemostasis including patients with pulmonary hypertension, chronic obstructive pulmonary disease (COPD), and with a past history of pulmonary wedge resection surgery.^{12–14} Despite this evidence, local thrombus formation is not routinely considered in patients with obstruction of the pulmonary artery.

The strongest support for a model of *in situ* pulmonary artery thrombosis has come from trauma surgery literature. Several large retrospective studies of patients with chest trauma and PE report that up to 80% of patients have isolated PE without DVT and these authors suggest these findings are due to localized thrombi or 'acute peritraumatic pulmonary thrombus' rather than emboli.^{15,16} In this model, direct damage to the pulmonary vasculature and visceral tissue from chest trauma leads to activation of tissue factor and *de novo* localized thrombus formation.

INFLAMMATION AND THROMBOSIS FORMATION

Local inflammation is associated with a procoagulant state. One proposed explanation for this association is that activated coagulation in acute infection was evolutionarily advantageous to capture circulating microbes in localized thrombi to limit pathogenesis and spread of infection.¹⁷ Infection, inflammation, sepsis, and immune dysregulation cause release of tissue factor receptor activity from macrophages. Alveolar macrophages also express tissue factor.¹⁸ Tissue factor expressed by inflammatory cells promotes conversion of prothrombin to thrombin leading to a shift from a fibrinolytic environment to a thrombotic state.¹⁹ Local inflammation in the lung parenchyma might also be expected to lead to increased thrombosis in the lungs.

Risk factors for isolated PE differ from the risks of PE with DVT, which may be expected if isolated PE represents *in situ* thrombosis originating from a different pathophysiologic mechanism. PE without DVT is associated with a younger age, recent surgery and hospitalization without being bedridden.²⁰ Mortality for PE without DVT was 4.6% compared to 12.9% in patients with PE and DVT. In a recent retrospective review study,

Van Langevelde et al. examined risk factors for DVT and PE. They found diseases that cause pulmonary inflammation such as COPD, pneumonia, and sickle cell disease were associated with a high incidence of PE but not DVT. In the paper's discussion, they suggest that pulmonary inflammation may contribute to localized *in situ* thrombosis.²¹

Multiple recent studies support a connection between pulmonary inflammation and PEs. New research suggests clotting factors and tissue factor can pass between blood vessels into the airways of patients with asthma.²² In a large population-based study of 31,000 patients, asthma was associated with an increased hazard ratio of 3.24 for PE when compared to patients without asthma.²³ In another recent study of 648 patients with asthma, Majoor et al. found that patients with severe asthma had an increased risk of PE but not DVT.²⁴ Similarly, patients with COPD have an increased incidence of PE; up to 25% of patients have concurrent PE during exacerbations.^{25,26} This evidence suggests physicians can no longer consider diseases of the pulmonary circulation separately from diseases of the airways.²⁷

LIMITATIONS TO A MODEL OF *IN SITU* PULMONARY ARTERY THROMBOSIS

Although recent studies suggest a connection between local pulmonary inflammation and pulmonary thrombus, there are also several significant limitations to the theory of *in situ* thrombosis. Many of these limitations were first laid out by Velmahos et al. in their 2009 paper introducing a model of *in situ* thrombus in trauma patients.²⁸ The first limitation is the possibility that when PEs are being detected without peripheral DVTs, the entire clot dislodges instead of a part of the clot breaking off, and so DVTs are not detected on ultrasound scans of the extremities. Another possible explanation is that current compression ultrasound techniques are not sensitive enough to detect all peripheral DVTs in the extremities and so they may be present and contributing to PEs but remain undetected. A third possible explanation is that a subset of PEs originates from clots in the upper extremities or pelvic veins, which are not routinely scanned by compression ultrasound.

To address these limitations, Van Langevelde et al. completed a prospective study of 100 patients with CTA diagnosed PE and used full body MRI scans to look for peripheral thrombosis in the upper extremities, pelvis, and abdomen in addition to the lower extremities. They found that 56% of patients had isolated PE without any peripheral thrombus.²⁹ This study did not

address the possibility that these findings were due to cases where the entire clot dislodged from the peripheral vein. Other limitations include the fact that MRI may not be highly sensitive for thrombus and thus may not be detecting all peripheral clots. Van Langevelde et al. also suggested that thrombi in the pulmonary artery could originate from thrombi right atrium in patients with atrial fibrillation.

CLINICAL IMPLICATIONS

Treatments are not likely to change for *in situ* thrombosis when compared to those for PE. Current research shows that patients should receive 3 months of anticoagulation for venous thromboembolism with reversible, provoked etiologies and indefinite anticoagulation for patients with unprovoked, or persistent and progressive etiologies.³⁰ Case studies suggest localized thrombus does not undergo fibrinolysis in the 3 months patients with idiopathic PE receive anticoagulation for active disease.¹⁴ Due to ongoing disruption of smooth blood flow and the pulmonary fibrinolytic environment, patients with *in situ* pulmonary artery thrombosis likely require indefinite anticoagulation. Treatment of patients with placement of inferior vena cava filters (VCFs) is likely to differ in patients with *in situ* thrombosis as compared with PE. VCFs are placed in patients with PE with contradictions to anticoagulation to prevent recurrent emboli from traveling from the pelvic veins and lower extremities up the inferior vena cava to the pulmonary arteries.³¹ If the thrombosis originates in the lung, VCFs would be unnecessary in patients receiving anticoagulation.

The most serious consequence of *in situ* thrombosis is likely pulmonary hypertension and right heart strain. Chronic thromboembolic pulmonary hypertension (CTEPH) develops in 4.6% of patients with acute PE, resulting in considerable morbidity and mortality.³² Patients with *in situ* pulmonary artery thrombosis are likely at increased risk for development of CTEPH due to retained residual clots and disrupted blood flow. Due to concern for right heart strain and potentially CTEPH, frequent echocardiography may be warranted in patients with *in situ* thrombosis.

FUTURE INVESTIGATIONS

Although there is evidence of localized thrombosis in the pulmonary arteries, there are few studies that investigate the pathophysiology of these phenomena. Currently, research in this area is focused on *in situ* thrombosis in trauma patients. One group, Kumar et al.⁵ recently published a study examining the response of

pulmonary artery endothelium to inflammatory mediators to explore the molecular origins of *in situ* thrombosis in trauma patients. Future directions could focus on autopsy studies to determine if *in situ* pulmonary artery thrombosis can be differentiated from pulmonary embolus based on histology. There is no current data available on treatment outcomes for patients with *in situ* thrombosis, and future research should also examine whether treatment for *in situ* thrombosis should include surgical therapy to reduce clot burden in patients with right heart strain or CTEPH.

Thus far, investigations of *in situ* thrombosis have focused on diagnosis by CTA.

Transesophageal echocardiogram (TEE) is also potentially a useful way to examine the pulmonary arteries. Future research should focus on identifying thrombus formation and examining if it is possible to differentiate thrombus from emboli with TEE. Due to increased risk of PE and likely *in situ* thrombosis in patients with COPD and asthma, a study of TEEs in this patient population to screen for PEs, thrombosis, and possible right heart strain may yield additional information about the role of venous thromboembolism in pulmonary diseases.

CONCLUSION

PE is a common disease with significant mortality. When filling defects are found on CTA, they are almost universally assumed to be emboli from a peripheral DVT. However, new studies have found that half of all PEs are found without evidence of a peripheral thrombus. These findings have led to the theory that localized inflammation, endothelial cell damage, and disruption of blood flow cause *de novo* formation of clots within the pulmonary artery or *in situ* thrombosis. Although treatment with anticoagulation would likely not change for patients with *in situ* thrombosis as compared to PE, patients with *in situ* thrombosis would likely not benefit from placement of VCFs. Patients with COPD and asthma are at increased risk for PE and are also likely at risk for *in situ* thrombosis. The theory of *in situ* thrombosis presents a new perspective on the traditional understanding of the pathophysiology of PE. Further research needs to be done to truly understand the clinical implications of this new model in terms of treatment, patient outcomes, and prevention.

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Sticking to the Plan: Patient Preferences for Epidural Use During Labor

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Background: Women have been shown to value control in the labor experience, a desire that is often formalized into an explicit birth plan. Epidural preferences are a primary component of this plan. Despite this specification, women's plans are not always carried out. This may be due to patient factors (e.g., dissatisfaction with labor), provider behaviors (e.g., frequent epidural offers), or situational variables (e.g., prolonged labor).

Purpose: The current study investigates the relative impact of patient preference for epidural use as compared to provider suggestion and circumstances of labor. It hypothesizes that providing an epidural preference in a birth plan and receiving frequent epidural offers will predict epidural administration.

Methods: Adult, postpartum women were surveyed about their labor experience at a high-volume obstetrics unit in a medium-sized community hospital. Responses to a structured survey instrument focused on prelabor preferences and labor characteristics. Descriptive statistics and multiple logistic regression modeling were used to analyze participant responses.

Results: Eighty-three postlaboring women completed surveys, of which 79 surveys were analyzed. Eighty-four percent (N = 66) received an epidural during their labor process, while 73% (N = 58) desired an epidural as a part of their birth plan. Women were offered an epidural at a mean frequency of 0.27 ± 0.48 times per hour (median = 0.14). The significant predictors of epidural administration were desire for an epidural in the birth plan ($p < 0.01$) and the frequency of epidural offers ($p < 0.01$). Wanting an epidural was associated with receiving an epidural. Conversely, increased frequency of being offered an epidural negatively correlated with epidural administration.

Conclusions: Our findings indicate that personal preference is the most influential factor in determining whether or not a laboring woman will receive an epidural. Increasing provider attempts to offer an epidural – as represented by increased frequency of queries – decreased the likelihood that an epidural would be received.

Keywords: epidural; birth plan; labor analgesia; patient preference; decision making.

INTRODUCTION

Though few would deny the value of shared decision making in obstetric management, the extent to which patient preferences should dictate care still remains a controversial issue. The inherently asymmetric patient-provider relationship¹ has been forced to evolve in this particular setting, accommodating shifts in cultural values pertaining to women's involvement in and control over the birth experience. Birth plans, written documentation or explicit verbalization of women's preferences prior to the onset of labor, have played a major role in empowering patients in the labor process. In addition to specifying what procedures women desire or hope to avoid, birth plans are currently seen as a tool for improving communication² in that they provide an organized set of talking points, educational objectives, and guiding principles for the healthcare team. A 'good' birth plan, one that is

satisfactory to the patient, is largely concerned with women's control in the labor process,³ meaning that these plans represent personal expressions of patient values and expectations.⁴ Despite their clarifying intent, these patient-centered plans generally make specific reference to interventions that have traditionally been recommended under the discretion of healthcare professionals, creating the potential for interpersonally challenging negotiations as labor proceeds.

Epidural administration is a particularly meaningful aspect of labor management from the patient perspective, one that has been subject to changing professional opinion over the last decades. In surveying a group of postpartum women (N = 63), Pennell et al. found that preferences for pain control (including epidural use) were the most common element of birth plans, followed distantly by preferences regarding invasive interventions

for vaginal delivery, cesarean delivery, and 'natural childbirth' not otherwise specified.⁵ Accordingly, epidural analgesia use is increasing for laboring women. Patient requests for epidural pain relief have trended upward from 1995 to 2001, rising from 57 to 66.5% of women interested in having an epidural. Opioid use and medication-free birth have both undergone a compensatory decrease in popularity.⁶ Fluctuating patient and provider views on epidural pain control are likely to be implicated in the shift towards its use. Of the common obstetric procedures, epidurals have the largest percentage of patient participation in the decision-making process compared to ultrasound scans, blood tests, fetal monitoring, and cesarean sections.⁷ Relatedly, patients subjectively reported feeling informed on the risks and benefits of the epidural procedure. Their level of confidence in epidural knowledge is second only to cesarean section (inclusive of pre- and postlabor procedures).⁷

Patients' apparent comfort in engaging with epidural decision making does not imply that they have an objective understanding of the procedure's indications and maternal-fetal risks. Studies suggest that patients often espouse inaccurate information about epidural use.⁸ Multiple surveys indicate that physicians are the least common source of information on epidurals. Family members, friends, and midwives tend to be the primary overall information sources for women constructing a birth plan,⁹ where similar sources are consulted specifically on epidural use.⁵ Though physicians are not the primary source of patient knowledge, it is their ultimate choice as to whether or not an epidural is placed, a decision that is based on their expertise and preference. The overarching role of physicians in alleviating pain undoubtedly impacts their standpoint on this issue. The inherent tension to respect patient preferences and to offer pain relief is illustrated in the guidelines of the American College of Obstetricians and Gynecologists:

... [With the exception of labor] there is no other circumstance where it is considered acceptable for an individual to experience untreated severe pain, amenable to safe intervention, while under a physician's care.¹⁰

As both patients and physicians are major stakeholders and active participants in the epidural decision-making process, the rationale behind any given epidural placement is likely to be multifactorial, representing priorities of both parties. However, to the best of our knowledge, no study has rigorously investigated the

determinants of epidural use in the context of uncomplicated labor processes taking place in a US community-based teaching hospital. The current study considers women's epidural preferences (i.e., birth plans), providers' encouragement, and features of the labor process as potential predictors of epidural use. Our objective is to determine the extent to which women retain control over their pre- and perinatal analgesic experience through their birth plan specifications.

The central question of our study is as follows: are women's preferences for epidural use (as expressed by their birth plans) the primary predictors of whether or not they receive epidural analgesia during the labor process?

Hypothesis 1: The inclusion of an epidural in a predetermined birth plan is a significant positive predictor of receiving an epidural during labor.

Hypothesis 2: There is a significant direct relationship between the number of times per hour a laboring woman is queried about receiving an epidural and the likelihood of actually receiving an epidural during labor.

By exploring the factors that influence whether or not a laboring woman will receive an epidural, we hoped to determine the degree to which women's preferences are being respected in the labor process.

METHODS

Selection and Description of Participants

Participants were recruited as a convenience sample of postpartum patients admitted in spring 2011 to the 34-bed postpartum Mother-Baby unit of a high-volume obstetrics hospital in central/mid Michigan. The patient population of this community hospital's obstetrics ward is notable for its diversity – a great variety of socioeconomic and cultural backgrounds are represented. Among these are groups for whom sharing de-identified demographic information is an especially sensitive issue (e.g., refugees). Though participants were required to be at least 18 years of age to participate in the study, we chose not to collect specific demographics on individual patients as it may have discouraged certain patients from participating.

Potential participants were asked if they would like to complete a brief questionnaire regarding their labor experience. Medical students on the research team obtained informed consent from participants and read them the questionnaire, transcribing their verbal responses to each item. The environment for survey

administration varied between patients in terms of the presence or absence of family members and the exact delivery to interview time interval. All surveys were completed within 48 hours of delivery. The Michigan State University institutional review board (IRB) exempted this methodology after reviewing our procedures and instrument (IRB x11-1135Se).

Eighty-three participants were recruited for the study. Four subjects were subsequently excluded from the analysis because they did not report an epidural preference before entering the active stage of labor. They reported that they were 'unsure' regarding their preferences for receiving an epidural, reducing the number of subjects from 83 to 79. By definition, the participants that were retained all had some form of birth plan, as characterized in the Introduction section above. The vast majority of the patients surveyed here presented their birth plans as a set of verbal instructions to a healthcare provider. For some, this was realized in general terms (e.g., 'I would like as natural of a birth process as possible'), while others were more specific (e.g., 'I want an epidural'). All of these variants were considered birth plans for the purposes of this study, as long as they gave a clear indication of patient preferences for pain management.

Survey Instrument

The survey consisted of eight closed-ended questions (Table 1) that covered participant intentions on epidural use, evaluation of their current labor experience, and their reflections regarding possible future labor.

Statistics

In order to test the hypotheses given above, we constructed one multiple logistic regression model

predicting whether or not our subjects received epidurals. Wanting an epidural as indicated in one's birth plan (Hypothesis 1) and the number of times one was offered an epidural per hour (Hypothesis 2) were included as potential predictors. Number of offers was treated as a rate, meaning that these occurrences were relativized to the length of each woman's labor process (henceforth discussed as 'frequency' of queries). Overall satisfaction with the labor process was also incorporated as a possible mediator of the aforementioned predictors. Number of hours in labor and administration of oxytocin were not integrated into this analysis due to overly skewed distribution of the variants of these factors with respect to each other and our dependent variable. The final multiple logistic regression model was generated using model building techniques supported by Rbrul¹¹ in the R statistical environment.¹²

RESULTS

Our subjects' survey responses are summarized in Table 2. The majority of our subjects (84%, $N=66$) received an epidural during their current labor process. Approximately three quarters (73%, $N=58$) of our subjects specified that they wanted an epidural before going into labor. A relative minority of subjects received oxytocin for their current labor process (43%, $N=34$). More than half of the subject pool had previously received an epidural in a prior episode of labor (73%, $N=58$).

There was very little variation in women's satisfaction ratings for their current labor processes. Furthermore, there was a clear ceiling effect whereby the vast majority of respondents rated their labor process as 9 or 10 of 10. The mean satisfaction was 9.32 ± 1.07 .

Table 1. Survey instrument. Question wording is reproduced verbatim as read by the research team

Question	Answer options
Did you intend on having an epidural prior to onset of labor?	Yes, no, undecided
Did you receive an epidural as part of your labor and delivery process?	Yes, no, unsure
How many times do you recall being asked if you wanted an epidural?	0, 1–2, 3–5, > 5
How long was your labor from time of arrival to Sparrow Hospital until birth?	
Was your labor induced or augmented with pitocin?	Yes, no, unsure
Rate the satisfaction of your labor delivery experience at [Hospital] on a scale of 1–10 (1 being extremely dissatisfied and 10 being extremely satisfied).	1–10
If you received an epidural rate the level of pain relief you received from it on a scale of 1–10 (1 being no relief at all and 10 being complete relief of pain).	1–10
Would you choose to have an epidural with a subsequent pregnancy?	Yes, no, unsure

Answer options were communicated to the patient, but not displayed visually.

Table 2. Counts and descriptive statistics for participant responses

Factor	Variants	N_{subjects}	Proportion	Mean	Standard deviation
Received epidural	Yes	66	0.84		
	No	13	0.16		
Prior epidural	Yes	58	0.73		
	No	21	0.27		
Wanted epidural	Yes	58	0.73		
	No	21	0.27		
Oxytocin received*	Yes	34	0.43		
	No	45	0.57		
Satisfaction	1–10			9.32	1.07
Hours in labor*	1–72			11.16	11.59
Frequency of queries	0–3			0.27	0.48

Factors marked with an asterisk (*) were not included in the multiple logistic regression model due to their skewed distribution with respect to other factors.

By contrast, hours of labor varied greatly from subject to subject. The mean was 11.16 ± 11.59 (median = 8.5). The skew in this parameter is due to a handful of labors lasting longer than 24 hours, notably including 48 and 72 hours labor durations.

Similarly, the frequency with which women were asked whether or not they wanted an epidural during their labor process exhibited substantial variability, with a mean of 0.27 ± 0.48 times per hour (median = 0.14 times per hour). Again, a few women experienced a much higher than average rate of queries.

Subdividing the data into women who received epidurals versus those who did not, additional trends emerge (Table 3 and Fig. 1). As demonstrated in Fig. 1, when compared to women who did not receive an epidural, a greater proportion of subjects who received an epidural had expressed a desire for an epidural in their birth plan. Other factors that may have contributed to

whether or not an epidural was received include having had an epidural in a prior pregnancy, having more opportunities to receive an epidural in the current labor process, and administration of oxytocin to augment the present labor process (Table 3). With respect to prior epidural administration, most women who received an epidural in the current pregnancy also had one during a previous pregnancy (80%, $N = 53$). Focusing on the number of times women were offered an epidural during labor, the most substantive jump in receiving an epidural occurred between 0 and 1–2 queries. Sixty-three percent of subjects who were not specifically offered an epidural received one ($N = 7$). In contrast, greater than 85% of women who were asked 1–2, 3–5, or greater than five times received an epidural ($N = 37$ for 1–2 queries, $N = 16$ for 3–5, $N = 6$ for > 5 ; see Fig. 2). Lastly, an overwhelming majority of the subjects who received oxytocin also received an epidural (99%, $N = 33$).

Wanting an epidural, frequency of epidural offers (as distinguished from number of offers), and overall satisfaction with labor were incorporated as predictors into a multiple logistic regression model of present epidural administration. Table 4 displays only those factors retained in the output of the Rbrul analysis as significantly predicting the distribution of epidural administration. Two significant predictors were retained in our model of receiving an epidural: desire for an epidural in the birth plan ($p < 0.01$) and frequency of epidural offers ($p < 0.01$). As predicted in Hypothesis 1, wanting an epidural was associated with receiving an epidural. Contrary to Hypothesis 2, however, frequency of queries negatively correlated with administration of an epidural. These results are summarized in Table 4 and illustrated in Fig. 2.

Table 3. Distribution of response counts with respect to subjects receiving or not receiving an epidural

Factor	Variants	Received epidural	No epidural
Prior epidural	Yes	53	5
	No	13	8
Times queried	0	7	4
	1 to 2	37	6
	3 to 5	16	2
	> 5	6	1
Oxytocin received	Yes	33	1
	No	33	12

Epidural preference is excluded from this table as it is displayed in Fig. 1. Note that 'Times queried' as shown here is differentiated from 'Frequency of queries' (the rate of queries per hour in labor) reported in Table 2.

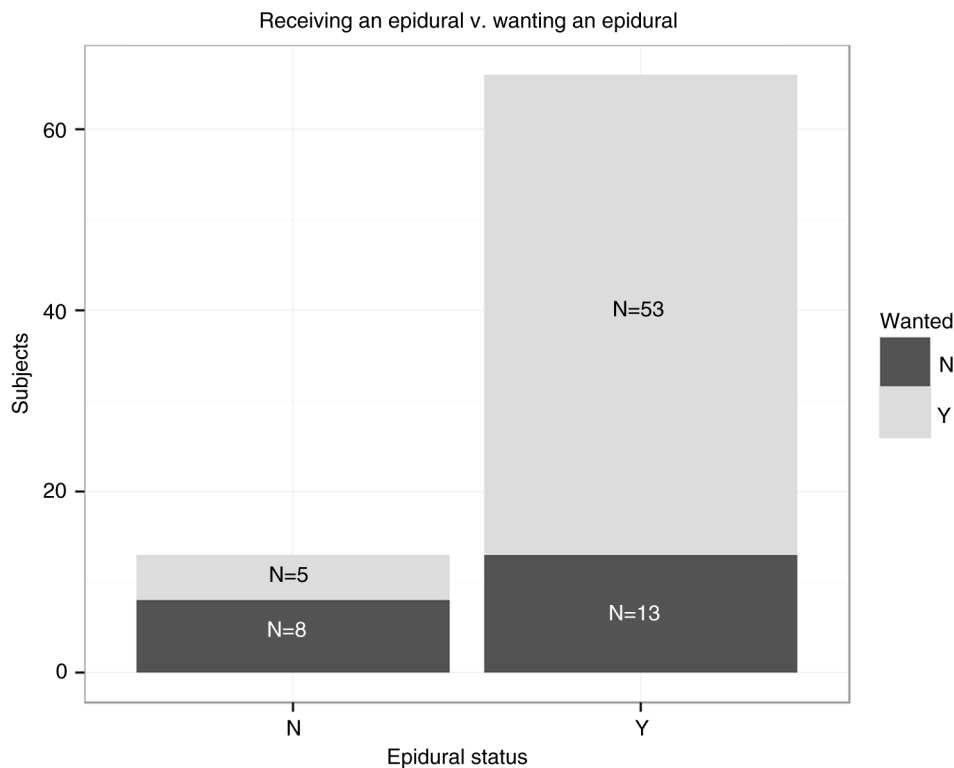


Figure 1. Women who received an epidural (Y) compared to those who did not receive an epidural (N) subdivided by those who wanted to receive an epidural (Y) compared to those who did not want to receive an epidural (N).

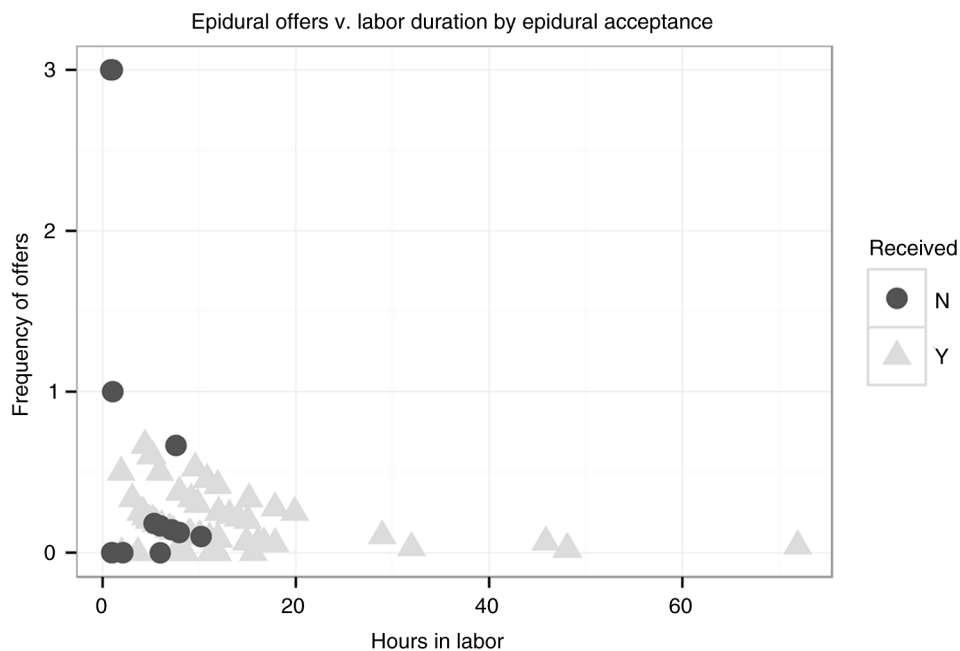


Figure 2. Frequency of epidural offers (times asked per hour) plotted against hours in labor. Women who received an epidural (Y) are distinguished from those who did not (N).

Table 4. Significant predictors of epidural administration

	Receiving an epidural (vs. not receiving an epidural)		
Grand mean 'receiving'	0.835		
Total N	79		
Deviance	52.246		
	Log odds	%	N
Wanting $p < 0.01$			
Yes	1.17	91.4	58
No	− 1.17	61.9	21
Frequency $p < 0.01$			
Continuous	− 1.87	N/A	N/A

Results are in the direction of receiving an epidural. Factors included in the analysis: wanting an epidural (wanting), frequency of epidural offers (frequency), and patient satisfaction.

DISCUSSION

Overall our findings suggest that women's preferences for epidural administration are major influences on whether or not they receive an epidural. This is particularly evident in the results of our regression analysis, which selected patient desire for an epidural as one of two significant predictors for epidural administration. Increasing frequency of provider epidural offers, the other significant factor in our model, actually had a negative predictive effect on epidural use. In other words, women who did not plan on having an epidural were less likely to receive one and, furthermore, multiple offers per hour decreased their likelihood of accepting an epidural. It may be the case that iterative offers reinforce women's desires to adhere to their original birth plans.

The dominant effect of patient preference in our model of epidural administration is consistent with prior literature indicating that women's opinions on epidural use are adequately expressed⁵ and generally respected. Though reported rates of birth plan follow-through vary, our research corroborates previous suggestions that this variability is patient-mediated.¹³ A qualitative study by Hidaka et al. following primigravid women into labor provides context for this observation.¹⁴ They describe a transition from envisioning an ideal labor process to confronting the reality of extreme pain, beyond the expectations they had while constructing birth plans. Most of the women in this study elected to deviate from their initial intent of medication-free birth based on their own re-evaluation of the experience, yet remained satisfied with their labor processes.¹⁴

Satisfaction with the labor process in general did not predict whether or not an epidural was given. This is

counterintuitive inasmuch that prior studies reported an association between labor dissatisfaction and epidural use in women who did not want an epidural as part of their birth plans.¹⁵ The high rate of satisfaction in our study suggests, however, that this apparent discrepancy may be a methodological artifact. As our study surveyed women with uncomplicated births in the immediate postpartum period, our satisfaction results may be less indicative of concordance between labor process and birth plan and more reflective of women's successful pregnancy outcomes. Hodnett's commentary on a meta-analysis of satisfaction with childbirth supports this possibility.¹⁶ She notes that randomized control trials (RCTs) for pre- and peripartum interventions often fail to demonstrate the inverse relationship between medications/procedures and satisfaction shown in observational studies. She interprets this discrepancy as an effect of the necessary inclusion of complicated births in prospectively recruited RCTs, where said complications and their sequelae (e.g., prolonged labor, anxiety, and pain) mediate the relationship between intervention and satisfaction.¹⁶

Integrating across the variables considered here, our results generally emphasize a high degree of patient control exerted over epidural administration. Patients appear to be directing their analgesia experience both prior to and during the onset of labor. Whatever conflict may arise between patient and provider views on epidural use, they seem to be resolved in a way that is satisfactory to the patient and reflective of her desires, given that her opinion on pain control is subject to change as labor proceeds. Thus, current practice as observed in our study seems to be in accordance with published guidelines for management of pain relief during labor: 'decisions about interventions should incorporate the woman's personal values and preferences and should be made only after she has had enough information to make an informed choice, in partnership with her care team'.¹⁷

Though our study highlights the relative autonomy that women seem to enjoy in intrapartum epidural decision making, it has several key limitations that should be addressed in future work. Most importantly, our sample size was small and potentially under-representative of the population of laboring women in our setting of interest. Factors that may have proven significant in a larger study of epidural administration may not have been selected in our analysis due to our limited sample size. Furthermore, a variety of demographic and pregnancy-related variables were not collected in our survey. Age, marital status, socioeconomic

class, education level, etc. might have played a role in determining epidural use, but these factors were not recorded here (see Methods for a discussion of this issue). For example, Miller et al. explores the cultural aspect of a woman's preferences and how they compete with economic position and birth option availability, concluding that labor process is ultimately shaped by economic position and resource access.⁴ Similarly, we did not survey any women with complicated pregnancies or stratify the labor processes of our surveyed women based on relative complexity (e.g., hours spent in labor, oxytocin administration). Though the later variables were recorded, they could not be modeled based on their distribution with respect to epidural use, suggesting that they might prove significant in a larger data pool where they might be included in statistical modeling processes. Hodnett's 2002 meta-analysis, discussed above, is consistent with this prediction.¹⁶

CONCLUSION

There are many ethical and practical concerns regarding laboring women's contribution to the epidural decision-making process. Our findings indicate that a woman's preference is the most influential factor in determining whether or not she receives an epidural for perinatal analgesia. Practitioners should be aware that the frequency of offers for an epidural has little or negative impact on a woman's acceptance of this intervention.

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Care for Laotian Ethnic Minorities: A Cross-National Study of Medical Students in Laos and California

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Background: In both the United States and Laos, Lao ethnic minority patients face cultural and linguistic challenges to adequate medical care. We may be able to learn from Lao experiences to improve care for patients in the United States. This study explored Laotian and American medical students' experiences in care for these patients.

Methods: Laotian and American medical students (n = 19) participated in five interview groups discussing barriers to health care and strategies for addressing barriers for Laotian ethnic minority patients.

Results: The students identified similar barriers to care. Laotian students identified unique strategies to address barriers to care. American students focused on general approaches to cross-cultural care.

Discussion: The strategies that Laotian medical students learn in their training reflect their extensive exposure to Hmong and other Laotian ethnic minority patients, while American students learn broad strategies to care for many minority groups. Further work is needed to determine if their experience can be translated into the domestic context.

Keywords: Hmong; Mien; Laos; refugees; cross-cultural healthcare; medical education.

BACKGROUND

After fighting alongside American forces against the North Vietnamese military in Laos, large numbers of Hmong and Mien Laotian refugees came to the United States in the 1970s.^{1,2} Since 1975, an estimated 30,000 Mien³ and over 130,000 Hmong⁴ have settled mostly in California, Minnesota and Colorado.⁵ The Hmong and Mien are also minorities in Laos⁶ and in both the United States and Laos, these groups face barriers to healthcare including language discordant care, culture-based belief differences and distrust of the system.⁷⁻¹⁹ These groups make up 100 times more of the population in Laos than in the United States, and the majority Lao Loum population has lived alongside them for centuries,²⁰ theoretically narrowing the cultural gap. With these differences noted, this study explored the experience of both Laotian and American students in caring for Hmong and other Lao ethnic minority patients.

METHODS

Interviews were conducted with a convenience sample of 10 students at the National University of Laos College of Medical Sciences in Vientiane, Laos, and 9 students at the UC Davis School of Medicine in Sacramento, CA, home to the third highest population

of Hmong residents in the United States.²¹ Interview groups were conducted between May and August 2011. The structure of these groups is described in Table 1.

The interviewer (KC) opened the discussion with two patient care examples from the literature^{22,23} and continued with a question guide that was developed through literature review (see Table 2). Interviews ranged from 2.25 to 3.5 hours and were conducted in English. To protect student anonymity, interviews were not audio or video recorded but the interviewer took copious notes using shorthand and transcribed the notes for analysis. Participants were compensated with refreshments.

The University of California Institutional Review Board (IRB) approved the study. Interviews conducted in Laos conformed to United States IRB standards due to the absence of an IRB equivalent in Laos.

Two authors (KC and OM) reviewed transcripts independently, generated codes and identified salient themes,²⁴ collaborating to determine major themes around barriers to care and strategies to improve care. Coding categories were applied to transcripts using Dedoose (Los Angeles, CA) qualitative analysis software.²⁵

Table 1. Interview groups and participant characteristics

	<i>n</i>	Interview length (h)	Gender (% female)	Age range, average	Ethnicity	Training level last preclinical year (%) ^a
Lao group 1	4	3	75	20–23, 21	Lao Loum, 100%	100
Lao group 2	6	3	83	21–32, 24.5	Lao Loum, 100%	100
US group 1	3	2.25	100	22–27, 24.7	African American, 33% Caucasian, 66%	66 ^b
US group 2	3	2.5	33	23–24, 23.7	Chinese, 66% Taiwanese, 33%	100
US group 3	3	2.5	33	22–25, 23.3	Chinese, 33% Caucasian, 66%	100

^aAll students interviewed were in their last preclinical year, that is, the second year (total 4 years) for American students, and the third year (total 5 years) for Lao students.

^bOther statements from a phlebotomy student were excluded in Dedoose analysis for themes.

RESULTS

Common Barriers

American and Laotian students both raised concerns about cultural barriers to healthcare for Laotian ethnic minority patients. Identified barriers in both Laos and the United States included language, religious differences, expectation of involvement of elders in care decisions, limited health literacy and preference for herbal medicine rather than Western medicine. Other barriers that were more specific to the Laotian experience included access problems such as cost of care and distance to care facilities, and barriers at the level of the health care provider such as concerns about provider shortages and inadequate compensation.

Despite their agreement that significant barriers to care exist for Laotian ethnic minority patients, the students were similarly optimistic about the patients that sought care. A Laotian student said, ‘If they [Hmong patients] are coming to you [the physician], somewhere in them they’re open even if they don’t think so. It was their choice to come in’. In an American group, a student echoed this sentiment; ‘The fact that the

patient came to see the doctor is because they have some small part of belief in the doctor’.

US Approach to Barriers

US students offered general solutions rather than specific strategies for overcoming barriers, including broad concepts such as community empowerment, improving trust and patient-centered care. Students suggested that providers could address barriers to care by having knowledge of available community resources, working as a team with other healthcare providers and employing ‘cultural humility’ but were unable to provide specific strategy examples based on their preclinical exposure to the hospital setting. For instance, they believed it would be useful to employ more interpreters and cultural brokers, but after speaking about cultural brokers used in Hispanic populations, an American student was asked if this kind of solution existed for Hmong patients. He responded, ‘Not to my knowledge, I’m just envisioning a perfect system’. They also felt conflicted about some specific approaches, such as their ability to discuss herbal medicine use with patients in the absence of support from attending physicians. One student explained, ‘If we ask, “Hey, can they take herbal?” and [the attending] won’t discuss, over time the more likely we are to be that way ourselves’.

American students drew from their knowledge of diverse groups in discussing barriers faced by Lao ethnic minority patients, referencing experiences with AIDS patients in Africa, Jehovah’s Witnesses and blood transfusion, Ayurvedic medicine, the history of the Tuskegee experiment, traditional medicine use among Asian and Russian patients, and cultural brokers with Hispanic patients.

Table 2. Discussion guide

Question stem: ‘Based on your current level of education and experience . . .’
1) What barriers to health care face the Lao ethnic minority community?
2) What steps can be taken to overcome these barriers for Lao patients?
3) How is the Lao patient’s perspective addressed?
4) What approach do you take when the problem is discomfort with Western medicine?
5) What kind of practice do you get with these situations in school?

Lao Approach to Barriers

Laotian students discussed specific approaches to learning about care for Lao ethnic minorities (see Table 3). They discussed a month-long rotation during their first clinical year requiring students to live in a rural village providing care for a Laotian ethnic minority group, including both Hmong and others. The experience involved teaching the village about Western medicine and learning about traditional medicine, cultural practices and recipes for herbal remedies from the villages. One student summarized, 'First, the team [that] go to the village should know about how they live, not "talk talk talk" then come straight back ... or else it is like the man who went to give a speech to a crowd, and he talked and talked but didn't look around him, and when he finished he looked out and only one person was left standing in the crowd'.

In the hospital, Laotian students reported that in preclinical shadowing, it was standard practice for an educated Hmong layperson to be available to explain health problems and decisions to Hmong patients. According to one student, 'If a Lao person tells something to a Hmong patient, they don't believe as they would if a Hmong person tells a Hmong person'. They also reported education on herbal remedies in their course work and a willingness to use herbal medication

for minor illnesses. They described using that as leverage to persuade patients to use Western medicine when needed. 'For simple disease(s), like fever, we can let them take [herbs] and they get less side effects, but for severe disease(s) they have to take the correct medication'.

Finally, Laotian students reported that during their preclinical years they had often seen an entire extended family come to the hospital with a sick Hmong patient. The students assumed that the decision to treat the sick person did not lie with the parents or the patient only, but with the clan elders and family. They noted discordance with Western medicine practice in which patients were expected to make health-related decisions immediately, whereas for Hmong patients, these decisions often could not be made quickly or individually and depended on the opinion of the elder. One student summarized, '... they always have one person they respect the most. The doctor needs to go to that family member to explain what they have to do and if they don't what could happen to the patient'.

LIMITATIONS

Our study has some limitations. First, students were chosen via convenience sampling, which biased the sample to include only Lao students who were able to

Table 3. Summary of Lao medical educational strategies for improving care for Laotian ethnic minority patients, per students

Strategies to improve care	Examples from medical education	Possible applications for American students
Provide systematic, ideally immersive, opportunities for students to learn about communities	Laotian students spend a month in rural minority villages during clinical training to develop an understanding of culture and traditional medicine	Elective time in refugee clinic
Incorporation of education about use of traditional and herbal medicines	Laotian students learn to integrate traditional medicine into patient care, for instance, negotiating use of herbal medicines for minor illnesses in exchange for using Western medicine in the event of major illness such as malaria	Curriculum on herbal medication used in relevant patient populations
Allow for students to learn about family and elder involvement in care	Laotian students learn to allow elders to be involved in decision making for patients	Students should be trained to schedule family meetings with Laotian patients as soon as possible in hospital course
Increase opportunities for students to work with cultural brokers	Laotian students observed systematic use of not only a translator but also a transcultural mediator for care of Hmong patients	System-level endorsement of use of transcultural mediators in teaching hospitals
Build a conceptual framework around cross-cultural care	American students discussed need for cultural humility	Provide students with practical examples of community resources
Incorporate learning from other cross-cultural experiences	American students drew on their experience with diverse minority patient groups	Require in depth of relevant cultural groups during preclinical curriculum

speak English, a subset of students who may be different from their peers. Second, interviews were not recorded which could have resulted in some errors of omission; however, the pace of interviews was amenable to written transcription, and this method was chosen to minimize Lao students' concern of being identified as participants. Third, our small sample size could over- or underestimate students' exposure to Hmong patients. Finally, our study involved preclinical students with limited clinical experience. More clinical experience may improve student knowledge about cross-cultural care in the United States.

DISCUSSION

Medical school preparation to care for Lao ethnic minority patients differs greatly between Laos and the United States. Lao students reported receiving an education on Hmong and other minority patients that involved extensive interaction with them both inside and outside the hospital. Their educational experience gives them specific resources to apply to while caring for these patients. American students' education prepares them to care for different cultures in a more theoretical manner. Perhaps because American students are more likely to care for multinational patients, their education is less focused on specific minority groups. However, students would be well-served by a curriculum which introduces not only concepts and theories but also gives them an idea of what resources are available to assist them in caring for minority patients. Further studies should attempt to answer the question of how specific strategies used in Laos could be translated into the American context.

In a broader sense, the United States is culturally diverse, and refugees make up a particularly vulnerable patient population. Given that students will likely encounter a large number of refugees from around the globe,^{26,27} who face various barriers to healthcare,²⁸ it is important to consider this as part of their medical education curriculum. As noted here with Lao students, the doctors in refugees' home countries naturally work with them more extensively than American physicians. American physicians therefore could potentially learn specific strategies from international providers for addressing shortfalls in health outcomes, for instance, in the case of Hmong patients, incorporating families into care and flexibility in use of herbal medicine.²⁹

Future studies could attempt to implement specific strategies from refugee countries of origin, measuring effects on specific health outcomes and patient satisfaction. Implementation of strategies from the home

country need to be considered within the context of the US healthcare system and will require innovation in international collaboration.

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