



A Pilot Study to Address Tolerance of Uncertainty Among Family Medicine Residents

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BACKGROUND AND OBJECTIVES: Because patients often present to their family physicians with undifferentiated medical problems, uncertainty is common. Family medicine residents must manage both the ambiguity inherent in the field as well as the very real uncertainty of learning to become a skilled physician with little experience to serve as a guide. The purpose of this analysis was to assess the impact of a new curriculum on family medicine residents' tolerance of ambiguity.

METHODS: We conducted an exploratory quasi-experimental study to assess the impact of a novel curriculum designed to improve family medicine residents' tolerance of ambiguity. Four different surveys were administered to 25 family medicine residents at different stages in their training prior to and immediately and 6 months after the new curriculum.

RESULTS: Although many constructs remained unchanged with the intervention, one important construct, namely perceived threats of ambiguity, showed significant and sustained improvement relative to before undertaking this curriculum (score of 26.2 prior to the intervention, 22.1 immediately after, and 22.0 6 months after the intervention).

CONCLUSIONS: A new curriculum designed to improve tolerance to ambiguity appears to reduce the perceived threats of ambiguity in this small exploratory study.

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Family physicians care for patients of all ages with undifferentiated chronic and acute conditions, making uncertainty inherent in daily practice.^{1,2} Complexity of care provided per hour in family practice is 33% higher than that in cardiology and five times higher than that in psychiatry.³ Family physicians value both the breadth of care and its implicit uncertainty, which they consider part of their identity.⁴ Further, family medicine residents must learn

to become skilled physicians while managing clinical uncertainty. One study found that intolerance of ambiguity decreases with each year of residency training.⁵ Formal training might increase tolerance for uncertainty⁶; thus, the addition of a curriculum targeting ambiguity is worthwhile.⁷⁻⁹ We conducted an in-depth assessment of a novel outpatient curriculum to determine if we could influence family medicine residents' tolerance of ambiguity.

Methods

The Central Maine Medical Center's Institutional Review Board reviewed study activities and deemed it exempt. An exploratory quasi-experimental pre/post design was used to assess the impact of a new curricular experience where 4-week outpatient family medicine-teaching (OPFM-T) rotations were embedded into each year of residency training. We considered this study a pilot because we had not conducted a study like this previously, were unsure of its feasibility, and we did not have effect size data upon which to base power calculations.

The Educational Program

Despite different educational offerings during each year of training, overarching goals and measures for each OPFM-T were the same. Goals included increasing tolerance of ambiguity, competence, and confidence in caring for diverse, complex patient populations in ambulatory settings. The educational program was geared toward the learner's level of development and milestone expectations. Program curricula included specific readings, reflective writing, discussion, and ambulatory skill

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development using psychosocial/behavioral health tools and enhanced electronic health records. OPFM-T blocks differed from other OPFM blocks in that each resident spends 50% of their time in clinic each half day of the rotation along with 50% in formal educational sessions. Please see Appendix A (<http://www.stfm.org/Portals/49/Documents/FMAppendix/Taylor-AppendixA-FM2018.pdf>) for detailed information about OPFM-T.

Data Collection

Data were collected using four surveys: (1) Physicians' Reaction to Uncertainty Scale (PRUS) with reported Cronbach alpha coefficients of 0.74 to 0.85¹⁰; (2) Intolerance of Uncertainty Scale (IUS), with reported Cronbach's alphas of 0.94 to 0.96¹¹; (3) Budner's Intolerance for Ambiguity Scale (BIAS), with reported alpha coefficients between 0.63 and 0.64^{12,13}; and (4) Connor-Davidson Resilience Scale (CD-RISC) with reported alpha coefficient of 0.89.¹⁴ A review of the literature, which indicates subtle differences exist between tolerance of ambiguity and tolerance of uncertainty, led us to utilize a scale for each, and the PRUS was selected because it is physician-centric.⁸ These surveys were administered to residents once pre-OPFM-T and twice post-OPFM-T at two different time points. Time was protected on the last afternoon of the 4-week rotation to complete the first post-OPFM-T survey. The pre- and post-OPFM-T surveys were distributed to residents without protected time for completion, but a clear return date was provided.

Data Analysis

Characteristics of study participants were assessed using descriptive statistics. Scaled variables from each survey were scored according to described methods¹⁰⁻¹⁴ for summarizing factor or construct scores, handling missing items, and reverse scoring. Analysis of variance (ANOVA) was used to compare individual variables and subscale scores for all surveys. Though this was a pilot study, we set

our alpha level at .01 to account for multiple comparisons. SPSS version 24 was used for analyses.

Results

Response rates were 96% (24/25) prior to OPFM-T, 80% immediately following (20/25), and 68% (17/25) at 6 months post-OPFM-T. Participant age averaged 32.6 years (range: 25-48). Participants were predominantly male (52%) and Caucasian (72%; Table 1). One variable on the PRUS survey was borderline statistically different across the assessments related to OPFM-T rotations (Table 2): "I prefer patients not know when I am uncertain of what treatments to use" (2.9 prior to OPFM-T, 3.65 immediately post and 2.53 six-months post; $P=.03$). However, the computed construct score was not statistically different across the assessment periods. Individual variable and construct scores for the IUS survey (Table 3) showed no statistically significant changes pre- and postrotation.

Table 4 shows one individual variable, and its corresponding construct score for the BIAS survey was statistically different according

to timing of assessments. The variable, "An expert who doesn't come up with a definite answer probably doesn't know too much," had a score of 5.38 prior to the rotation, which dropped to 1.76 immediately following it and remained the same (1.71) 6 months postrotation ($P<0.001$). In addition, Construct 1 (Positive Tolerance of Ambiguity) also showed borderline significant changes according to the timing of the OPFM-T with a score of 26.2 prior to the rotation, 22.1 immediately after the rotation, and 22.0 6 months after the rotation ($P=0.02$). Table 5 shows individual variable and construct scores for the CD-RISC survey were not statistically different pre- and postrotation.

Discussion

We implemented this curriculum in response to residents' reports that they felt outpatient care was difficult because of its ambiguity. We hypothesized that a more standardized ambulatory care curriculum designed to augment role modeling and enhancing knowledge, skills, and attitudes by our family medicine clinical preceptors would reduce this ambiguity. Our small exploratory study found

Table 1: Characteristics of Participating Residents (n=25)

Characteristic	Value
Mean Age in Years (Standard Deviation)* Range	32.63 (6.53) 25-48
Sex Male (n=13) Female (n=12)	52.0% 48.0%
Race Caucasian (n=18) Black (n=2) Asian (n=5)	72.0% 8.0% 20.0%
Had a Career Before Medical School* Yes (n=15) No (n=9)	62.5% 37.5%
Married Yes (n=12**) No (n=13)	48.0% 52.0%
Children Yes (n=6) No (n=19)	24.0% 76.0%

* Missing for one resident.

** Eight entered residency married; the remaining three married in residency but before study participation.

that curriculum designed to improve tolerance of ambiguity influenced a single measurement construct within one of four scales we used to assess it: positive items in the BIAS survey.^{12,13} Budner defined intolerance of ambiguity as the tendency to perceive or interpret ambiguous situations as sources of threat,¹² with higher scores indicating greater perceived threat than lower scores. We found this construct scored higher prior to undertaking the OPFM-T and it decreased statistically, even in our small sample of residents, after undertaking this curriculum, a result that did not change 6 months after completing it. This suggests the curriculum may have helped reduce perceptions of ambiguity as a threat.

There are several consequences of anxiety associated with clinical uncertainty, including the link between intolerance to ambiguity and burnout.¹⁵ Thus, increasing residents' tolerance of uncertainty could help

decrease burnout and its negative consequences. Many training programs are investing considerable time and energy to bolster resident resilience and decrease burnout with wellness programs.¹⁶⁻¹⁷ Intolerance of clinical uncertainty also has repercussions for clinical care, as studies show that as physician anxiety about unclear clinical situations increases diagnostic testing and costs of care.^{12,18} One estimate suggests that 17% of excessive medical costs arise from physician uncertainty about diagnosis.¹⁷ While written guidelines regarding physician/patient communication in the face of clinical uncertainty exist,²¹ physicians may be reluctant to disclose their uncertainty to patients due to assumptions about perceived lack of skill or knowledge.² Other studies have unexpectedly shown that increased physician uncertainty led to improved patient satisfaction in shared decision-making models.^{14,19}

Though we find the results of this study promising, there are some limitations. This study was conducted in a single program with only 25 residents in different stages of training. The sample was too small to stratify our results according to training stage. These issues limit the generalizability of our findings. We did not include a control group in this study. Thus, it is possible that our sustained differences may have resulted from additional family medicine residency training.

In conclusion, curriculum designed to improve tolerance to ambiguity appear to reduce the perceived threats of ambiguity in this small exploratory study. We plan to utilize a qualitative approach in our next study to discern some of the more nuanced changes in knowledge, skills and attitudes in response to the OPFM-T curricular innovation.

Table 2: The Physician's Reaction to Uncertainty Scale (PRUS) According to the Timing of Outpatient Family Medicine Rotation (n=25)

Variable	Pre-OP-FM Rotation Mean (SD)*	Post-OP-FM Rotation Mean (SD)†	6 Months Post-OP-FM Mean (SD)^	P Value††
Stress From Uncertainty Constructs				
Construct 1: Anxiety Due to Uncertainty				
I usually feel anxious when I am not sure of a diagnosis.	3.96 (1.04)	3.55 (0.95)	3.82 (1.07)	0.42
I find the uncertainty in patient care disconcerting.	3.21 (1.10)	3.05 (0.95)	3.41 (1.18)	0.60
Uncertainty in patient care makes me uneasy.	3.50 (1.29)	3.05 (0.83)	3.06 (0.97)	0.29
I am quite comfortable with the uncertainty in patient care.**	3.42 (1.28)	3.55 (1.28)	3.06 (1.09)	0.47
<i>Construct 1 Computed Summary Score</i>	14.3 (3.8)	13.1 (3.1)	14.2 (3.3)	0.47
Construct 2: Concern About Bad Outcomes				
When I am uncertain of a diagnosis, I imagine all sorts of bad scenarios - patient dies, patient sues, etc.	3.21 (1.62)	3.25 (1.25)	3.12 (1.54)	0.96
I fear being held accountable for the limits of my knowledge.	4.13 (1.29)	3.60 (1.43)	3.82 (1.38)	0.45
I worry about malpractice when I do not know a patient's diagnosis.	2.92 (1.44)	3.10 (1.12)	2.94 (1.44)	0.89
<i>Construct 2 Computed Summary Score</i>	10.2 (3.8)	9.6 (3.1)	9.9 (4.0)	0.95

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Table 2, continued

Variable	Pre-OP-FM Rotation Mean (SD)*	Post-OP-FM Rotation Mean (SD)†	6 Months Post-OP-FM Mean (SD)^	P Value††
Reluctance to Disclose Uncertainty and Mistakes				
Construct 3: Reluctance to Disclose Uncertainty to Patients				
When physicians are uncertain of a diagnosis, they should share this information with their patients.**	5.50 (0.66)	5.10 (0.91)	5.29 (0.77)	0.25
I always share my uncertainty with my patients.**	4.52 (0.97)	4.03 (1.22)	4.47 (1.07)	0.28
If I shared all my uncertainties with my patients, they would lose confidence in me.	3.15 (1.33)	3.25 (1.45)	3.06 (1.25)	0.91
Sharing my uncertainty improves my relationship with my patients.**	4.50 (1.17)	4.48 (0.85)	4.41 (0.87)	0.96
I prefer patients not know when I am uncertain of what treatments to use.	2.90 (1.37)	3.65 (1.42)	2.53 (0.94)	0.03
<i>Construct 3 Computed Summary Score</i>	12.4 (3.3)	14.3 (3.8)	12.4 (3.7)	0.17
Construct 4: Reluctance to Disclose Mistakes to Physicians				
I almost never tell other physicians about diagnoses I have missed.	1.71 (0.75)	2.25 (1.12)	2.18 (0.95)	0.13
I never tell other physicians about patient care mistakes I have made.	1.54 (0.72)	1.85 (0.93)	1.76 (0.75)	0.43
<i>Construct 4 Computed Summary Score</i>	3.3 (1.4)	4.1 (1.8)	(3.7 (1.6)	0.17

* n=24 (96%) except question 6, where n=23.

† n=20 (80%).

^ n=17 (68%).

**Reverse scored in the construct computed score.

††Significance level set at 0.01.

Scale: 1=strongly disagree; 2=moderately disagree; 3=slightly disagree; 4=slightly agree; 5=moderately agree; 6=strongly agree.

Table 3: Intolerance of Uncertainty Scale (IUS) According to the Timing of Outpatient Family Medicine Rotation (n=25)

Question	Pre-OP-FM Rotation Mean (SD)*	Post-OP-FM Rotation Mean (SD)†	6 Months Post-OP-FM Mean (SD)^	P Value††
Factor 1: Uncertainty Leads to the Inability to Act				
Uncertainty stops me from having a firm opinion.	2.13 (1.26)	2.43 (1.21)	2.41 (1.12)	0.64
Uncertainty keeps me from living a full life.	1.63 (0.77)	1.76 (0.77)	1.65 (0.70)	0.82
When it's time to act, uncertainty paralyzes me.	2.08 (1.10)	1.90 (1.04)	1.94 (0.97)	0.83
Being uncertain means that I am not first rate.	1.92 (1.18)	2.00 (1.10)	1.76 (0.66)	0.78
When I am uncertain, I can't go forward.	2.00 (1.06)	2.00 (0.94)	1.76 (0.83)	0.70
When I am uncertain, I can't function very well.	2.21 (1.14)	2.19 (1.03)	1.94 (1.09)	0.71
The smallest doubt can stop me from acting.	2.00 (1.10)	1.90 (0.89)	1.94 (0.97)	0.95
Being uncertain means that I lack confidence.	2.04 (1.12)	2.05 (1.16)	1.71 (0.85)	0.54
I must get away from all uncertain situations.	1.58 (0.72)	1.90 (1.00)	1.53 (0.62)	0.28
<i>Factor 1 Computed Summary Score</i>	17.6 (7.5)	18.1 (7.7)	16.7 (6.3)	0.82

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Table 4: Budner's Intolerance of Ambiguity Scale (BIAS) According to the Timing of Outpatient Family Medicine Rotation (n=25)

Question	Pre-OP-FM Rotation Mean (SD)*	Post-OP-FM Rotation Mean (SD) [†]	6 Months Post-OP-FM Mean (SD) [^]	P Value ^{††}
Construct 1: Positive Items				
An expert who doesn't come up with a definite answer probably doesn't know too much.	5.38 (0.92)	1.76 (1.00)	1.71 (0.77)	<0.001
There is really no such thing as a problem that can't be solved.	3.29 (1.71)	2.76 (1.73)	3.88 (1.50)	0.13
A good job is one where what is to be done and how it is to be done are always clear.	2.54 (1.22)	2.86 (1.42)	2.53 (1.07)	0.64
In the long run it is possible to get more done by tackling small, simple problems rather than large and complicated ones.	3.92 (1.22)	3.90 (1.51)	3.88 (1.32)	1.00
What we are used to is always preferable to what is unfamiliar.	2.79 (1.06)	2.48 (1.21)	2.53 (1.42)	0.65
A person who leads an even, regular life in which few surprises or unexpected happenings arise, really has a lot to be grateful for.	2.54 (1.10)	2.62 (1.12)	2.47 (0.94)	0.91
I like parties where I know most of the people more than the ones where all or most of the people are complete strangers.	4.21 (1.38)	3.43 (1.40)	3.35 (1.17)	0.07
The sooner we all acquire similar values and ideals the better.	1.83 (1.20)	2.24 (1.22)	1.65 (0.79)	0.24
<i>Construct 1 Computed Summary Score</i>	26.2 (4.9)	22.1 (6.2)	22.0 (4.8)	0.02
Construct 2: Negative Items**				
I would like to live in a foreign country for a while.	5.04 (1.33)	5.14 (1.24)	4.59 (1.91)	0.49
People who fit their lives to a schedule probably miss most of the joy of living.	3.96 (1.27)	3.71 (1.23)	3.53 (1.23)	0.55
It is more fun to tackle a complicated problem than to solve a simple one.	4.13 (0.90)	4.33 (0.73)	4.50 (0.82)	0.36
Often the most interesting and stimulating people are those who don't mind being different and original.	5.17 (0.82)	5.33 (0.58)	5.24 (0.66)	0.73
People who insist upon a yes or no answer just don't know how complicated things really are.	4.25 (1.07)	3.95 (1.16)	4.12 (1.17)	0.68
Many of our most important decisions are based upon insufficient information.	4.54 (1.02)	4.48 (1.12)	4.29 (1.21)	0.78
Teachers or supervisors who give out vague assignments give a chance for one to show initiative and originality.	3.96 (0.86)	4.33 (1.02)	4.53 (0.87)	0.13
A good teacher is one who makes you wonder about your way of looking at things.	5.38 (0.92)	5.14 (0.91)	5.54 (0.52)	0.39
<i>Construct 2 Computed Summary Score</i>	19.6 (3.9)	19.3 (3.6)	20.0 (4.9)	0.89

*n=24 (96%) except question 1 and question 16, where n=21.

[†]n=21 (84%).

[^]n=17 (68%) except question 11, where n=16 and question 16, where n=13.

**All negative items are reverse scored.

^{††}Significance level set at 0.01.

Scale: 1=strongly disagree; 2=disagree; 3=mildly disagree; 4=mildly agree; 5=agree; 6=strongly agree.

Table 5: Connor Davidson Resilience Scale According to the Timing of Outpatient Family Medicine Rotation (n=25)

Question	Prior to OP-FM Rotation Mean (SD)*	Post-OP-FM Rotation Mean (SD)†	6 Months Post-OP-FM Mean (SD)^	P Value††
Factor 1: Personal Competence, High Standards, and Tenacity				
24. I work to attain my goals, no matter what roadblocks I encounter along the way.	3.16 (0.94)	3.33 (0.91)	3.47 (0.51)	0.49
12. Even when things look hopeless, I don't give up.	3.38 (0.92)	3.38 (0.97)	3.52 (0.62)	0.83
11. I believe that I can achieve my goals, even if there are obstacles.	3.50 (0.78)	3.52 (0.60)	3.47 (0.72)	0.97
25. I take pride in my achievements.	3.00 (0.98)	3.19 (0.81)	3.18 (0.88)	0.74
10. I give my best effort no matter what the outcome may be.	3.46 (0.72)	3.52 (0.60)	3.65 (0.49)	0.64
23. I like challenges.	3.29 (0.69)	3.14 (0.79)	3.35 (0.70)	0.65
17. I think of myself as a strong person when dealing with life's challenges and difficulties.	3.00 (0.93)	3.24 (0.94)	3.29 (0.59)	0.49
16. I am not easily discouraged by failure.	2.88 (0.90)	2.81 (1.12)	2.88 (0.33)	0.96
<i>Factor 1 Computed Summary Score</i>	25.8 (5.1)	26.1(5.4)	26.8 (2.3)	0.78
Factor 2: Trust in One's Instincts, Tolerance of Negative Affect, and Strengthening Effects of Stress				
20. In dealing with life's problems, sometimes you have to act on a hunch without knowing why.	2.75 (0.94)	2.67 (1.02)	2.65 (0.79)	0.93
18. I can make unpopular or difficult decisions that affect other people, if it is necessary.	2.96 (0.81)	2.86 (0.85)	2.82 (0.73)	0.85
15. I prefer to take the lead in solving problems rather than letting others make all the decisions.	3.13 (0.80)	3.15 (0.75)	3.12 (0.78)	0.99
6. I try to see the humorous side of things when I'm faced with problems.	3.13 (0.85)	3.24 (0.70)	3.17 (0.86)	0.90
7. Having to cope with stress makes me stronger.	3.00 (0.93)	3.48 (0.68)	3.41 (0.62)	0.09
19. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	3.00 (0.88)	3.19 (0.81)	2.88 (0.60)	0.48
14. Under pressure, I stay focused and think clearly.	2.79 (0.93)	2.85 (0.79)	2.71 (0.59)	0.85
<i>Factor 2 Computed Summary Score</i>	20.8 (3.5)	21.7 (3.9)	20.7 (3.0)	0.60
Factor 3: Positive Acceptance of Change, and Secure Relationships				
1. I am able to adapt when changes occur.	3.13 (0.80)	3.24 (0.62)	3.12 (0.49)	0.81
4. I can deal with whatever comes my way.	3.25 (0.53)	3.19 (0.68)	3.35 (0.49)	0.69
5. Past successes give me confidence in dealing with problems.	3.08 (0.93)	3.24 (0.62)	3.24 (0.83)	0.77
2. I have at least one close and secure relationship that helps me when I am stressed.	3.75 (0.68)	3.71 (0.56)	3.71 (0.59)	0.97
8. I tend to bounce back after illness, injury, or other hardships.	3.17 (0.92)	3.52 (0.75)	3.41 (0.62)	0.31
<i>Factor 3 Computed Summary Score</i>	16.4 (3.2)	16.9 (2.6)	16.8 (1.8)	0.78
Factor 4: Control				
22. I feel in control of my life.	2.83 (0.96)	2.95 (0.92)	2.71 (0.92)	0.72
13. During times of stress/crisis, I know where to turn for help.	3.13 (0.92)	3.57 (0.68)	3.12 (0.60)	0.10
21. I have strong sense of purpose in life.	3.29 (1.04)	3.25 (1.07)	3.41 (0.80)	0.88
<i>Factor 4 Computed Summary Score</i>	9.3 (2.6)	9.8 (2.3)	9.2 (1.7)	0.72

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Table 5, continued

Question	Pre-OP-FM Rotation Mean (SD)*	Post-OP- FM Rotation Mean (SD)†	6 Months Post-OP-FM Mean (SD)^	P Value††
Factor 5: Spiritual Influences				
3. When there are no clear solutions to my problems, sometimes fate or God can help.	1.88 (1.54)	2.33 (1.43)	2.00 (1.50)	0.58
9. Good or bad, I believe that most things happen for a reason.	2.75 (1.39)	2.81 (1.44)	3.18 (1.13)	0.58
<i>Factor 5 Computed Summary Score</i>	4.6 (2.7)	5.1 (2.7)	5.2 (2.3)	0.74

*n=24 (96%) except question 13, where n=23 and question 24, where n=25.

†n=21 (84%) except question 15, where n=20 and question 21, where n=20.

^n=17 (68%) except question 6, where n=18.

††Significance level set at 0.01.

Scale: 0=not true at all; 1=rarely true; 2=sometimes true; 3=often true; 4=true nearly all the time.

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