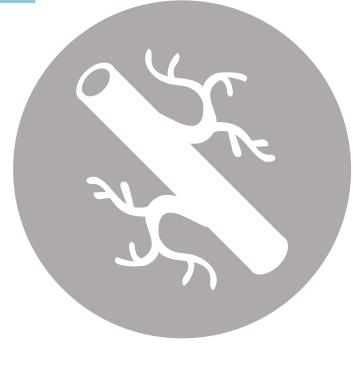# Patient Simulation in PAD: Effect of Education on Physician Performance

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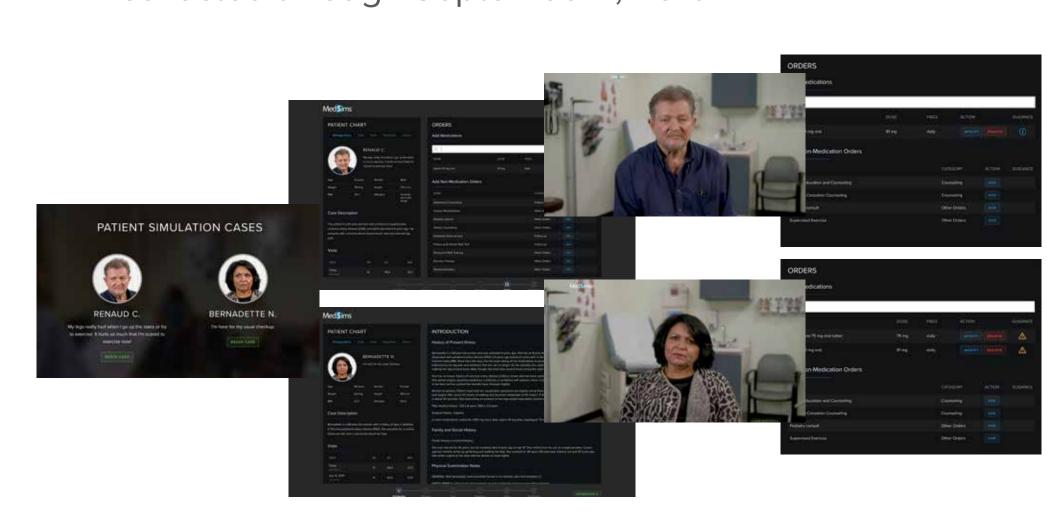
BACKGROUND

- Patients with peripheral arterial disease (PAD) are at high risk for cardiovascular (CV) events; yet many of them are not appropriately treated with antithrombotic therapy, leaving them at risk for limb loss and cardiovascular events[1]

- This study was conducted to determine if an online, virtual patient simulation (VPS)-based continuing medical education (CME) intervention could improve performance of cardiologists in using appropriate strategies to prevent CV events in patients with PAD

METHODS

- The CME intervention consisted of 2 cases (Figure 1) presented in a VPS platform that allowed learners to order lab tests, make diagnoses, and order treatments in a manner matching the scope and depth of actual practice[2]

- Clinical decisions made by the learners using open field entries within an electronic health record (EHR) interface were analyzed using an artificial intelligence engine and, after each decision, tailored clinical guidance (CG) was provided based on current evidence and expert recommendation

- Learner decisions were collected post-CG and compared with each user's baseline (pre-CG) data using a 2-tailed paired t-test to determine P values

- The activity launched on March 27, 2019 and data were collected through September 1, 2019

RESULTS

Patient Simulation Cases

- Significant absolute improvements were observed after CG for both patient cases
- Rationales for selecting appropriate antithrombotic therapy are described at the end of each Patient Case

PATIENT CASE 1

RENAUD C.
CASE SUMMARY

Renaud is a 61-year-old man who presents today with concerns about leg pain. He was diagnosed with hypercholesterolemia 10 years ago, which was initially treated with simvastatin. He has been treated with antihypertensives for the past 7 years, and 4 years ago he experienced unstable angina and required coronary stent placement. A drug-eluting stent was placed in the obtuse marginal artery off the circumflex coronary artery due to a 90% occlusion. His statin therapy was changed to high-intensity atorvastatin after the surgery. About 2 years ago he developed muscle pain and cramps in his legs, so his statin therapy was changed to rosuvastatin and the symptoms resolved.

Renaud recovered well after his stent placement and says he has had no chest pain or dyspnea at rest since then. However, he does have some dyspnea on exertion (DOE) after climbing 3 flights of stairs at his office and says this occurs regularly even after the stent placement. Recently, he has noticed leg cramping in his right leg after climbing stairs or exercise. He rates this pain at 7/10 at its worst, but says it resolves quickly with rest. He is now afraid to exercise knowing it will bring on this pain.

Review of systems: no chest pain or dyspnea at rest but has experienced DOE after 3 flights of stairs since his stent placement; no symptoms of transient ischemic attack (TIA) or cerebrovascular accident (CVA). No abdominal pain. Relates reproducible discomforts in right lower extremities after walking briskly up the stairs or after walking 1-2 blocks during the past 2 months. Resolves with 1 minute of rest. No improvement or worsening of exercise-induced leg pain with elevation or lowering of the legs

Age: 61 years	Gender: Male
Weight: 78.9 kg	Height: 175.3 cm
BMI: 25.7	Allergies: Penicillin and sulfa drugs

CHART 1.

Clinical Decisions Pre- vs Post-CG
Newly diagnosed patient with PAD

Clinical Decision	% Absolute Improvement	P-Value <.001 for all
Diagnose: PAD	57% → 74% +17%	
	54% → 74% +20%	
Diagnose: intermittent claudication	8% → 54% +46%	
	12% → 54% +42%	
Use ASCVD* Risk Estimator	51% → 62% +9%	
	60% → 70% +10%	
Continue: aspirin therapy	84% → 97% +13%	
	87% → 98% +11%	
Order: rivaroxaban	26% → 83% +57%	
	14% → 76% +62%	
Recommend dietary counseling	41% → 55% +14%	
	43% → 59% +16%	
Schedule: follow-up appointment	33% → 49% +14%	
	38% → 53% +15%	

Cardiologists (n=235): ■ % Correct Pre-CG ■ % Correct Post-CG
PCPs (n=733): ■ % Correct Pre-CG ■ % Correct Post-CG

Clinical Decisions Related to Patient Assessment and Treatment
Relevant Patient Assessment Decisions

Clinical Decision	% Absolute Improvement	P-Value <.001 for all
Diagnose: Intermittent Claudication	10% → 55%	
Diagnose: Peripheral Arterial Disease	57% → 78%	
Order: Electrocardiogram (ECG)	57% → 68%	
Order: ASCVD Risk Estimator	55% → 64%	
Order: Glycated Hemoglobin (HbA1C)	47% → 57%	

Relevant Treatment and Management Decisions

Clinical Decision	% Absolute Improvement	
Continue: aspirin	86% → 95%	
Start: rivaroxaban	8% → 32%	
Start: rivaroxaban and continue aspirin	8% → 33%	
Start: clopidogrel	7% → 22%	

Cardiologists Behavior Change (n=514): ■ % Pre-CG ■ % Post-CG

Rationales

Specialists have an opportunity to select 1-2 rationales for their choice in ordering or skipping treatments

Cardiologists % of Rationale Selections for rivaroxaban

- Efficacy demonstrated in COMPASS clinical trial — 30%
- Patient is at high risk for CV events — 29%
- Patient is at high risk for limb loss — 15%
- Efficacy in terms of reducing the risk for MALEs (Major Adverse Limb Events) — 14%
- Familiarity with current clinical guidelines (ESC/ESVS) — 7%
- Safety Profile — 5%

Cardiologists % of Rationale Selections for skipping rivaroxaban

- Lack of familiarity with drug in the setting of PAD — 25%
- Concerns about bleeding — 22%
- Cost — 22%
- Lack of familiarity with current clinical guidelines (ESC/ESVS) — 21%
- Patient's risk for CV events is not high enough — 10%

PATIENT CASE 2

BERNADETTE N.
CASE SUMMARY

Bernadette is a 68-year-old woman who was widowed 4 years ago. She has an 8-year history of type 2 diabetes, and she was diagnosed with peripheral artery disease (PAD) 2.5 years ago based on some pain in her legs and poor pulses and an ankle-brachial index (ABI). Since then she says she has been taking all her medications as prescribed and eating a healthy diet. She is bothered by her leg pain and mentions that she can no longer do the activities she used to enjoy. She still tries to remain active by walking her dog several times daily, though she must stop several times during the walk due to her leg pain.

She has no known history of coronary artery disease (CAD) or stroke and has never participated in a supervised exercise program. She denies angina; dyspnea; weakness; numbness; or problems with speech, vision, or balance. She denies diminished sensation in her feet, but has noticed her toenails have changed slightly.

Review of systems: Patient notes that her claudication symptoms are slightly worse than they were 6 months ago. She says the pain begins after about 25 meters of walking and becomes intolerable at 50 meters. If she stops to rest, she can resume walking in about 30 seconds. She tried sitting on a bench so her legs would hang down, but this did not relieve the pain.

Age: 68 years	Gender: Female
Weight: 64 kg	Height: 165.1 cm
BMI: 23.5	Allergies: None

CHART 2.

Clinical Decisions Pre- vs Post-CG
Patient with PAD and diabetes

Clinical Decision	% Absolute Improvement	P-Value <.001 for all
Order: duplex ultrasound of carotid arteries	52% → 66% +14%	
	53% → 68% +15%	
Diagnose: carotid artery stenosis	12% → 47% +35%	
	14% → 49% +35%	
Start: GLP-1 agonist therapy	9% → 38% +29%	
	18% → 23% +18%	
Start: rivaroxaban therapy	26% → 68% +42%	
	25% → 66% +41%	
Recommend smoking cessation	42% → 55% +15%	
	41% → 59% +18%	
Order: patient education and counseling	55% → 65% +10%	
	57% → 69% +12%	

Cardiologists (n=139): ■ % Correct Pre-CG ■ % Correct Post-CG
PCPs (n=402): ■ % Correct Pre-CG ■ % Correct Post-CG

Clinical Decisions Related to Patient Assessment and Treatment
Relevant Patient Assessment Decisions

Clinical Decision	% Absolute Improvement	P-Value
Diagnose: Carotid Artery Stenosis	13% → 47%	<.001
Order: ASCVD Risk Estimator	58% → 68%	<.001
Order: Ankle Brachial Index (ABI)	86% → 88%	<.030
Order: Duplex Ultrasouns (carotid arteries)	51% → 67%	<.001
Order: Glycated Hemoglobin (HbA1C)	74% → 79%	<.001

Relevant Treatment and Management Decisions

Clinical Decision	% Absolute Improvement	P-Value
Continue: aspirin	82% → 98%	<.001
Start: rivaroxaban	24% → 47%	<.001
Start: rivaroxaban and continue aspirin	24% → 47%	<.001
Start: clopidogrel	0% → 7%	<.005

Cardiologists Behavior Change (n=269): ■ % Pre-CG ■ % Post-CG

Rationales

Specialists have an opportunity to select 1-2 rationales for their choice in ordering or skipping treatments

Cardiologists % of Rationale Selections for rivaroxaban

- Efficacy demonstrated in COMPASS clinical trial — 37%
- Patient is at high risk for CV events — 28%
- Patient is at high risk for limb loss — 15%
- Efficacy in terms of reducing the risk for MALEs (Major Adverse Limb Events) — 8%
- Familiarity with current clinical guidelines (ESC/ESVS) — 8%
- Safety Profile — 4%

Cardiologists % of Rationale Selections for skipping rivaroxaban

- Lack of familiarity with drug in the setting of PAD — 33%
- Concerns about bleeding — 23%
- Cost — 19%
- Lack of familiarity with current clinical guidelines (ESC/ESVS) — 16%
- Patient's risk for CV events is not high enough — 9%

* ASCVD = atherosclerotic cardiovascular disease; GLP-1 = glucagon-like peptide-1; PCP = primary care provider.

CONCLUSIONS

- This study demonstrated that simulation-based CME that immerses and engages learners in an authentic and practical learning experience can improve evidence-based practices of cardiologists and PCPs, and suggests that this type of intervention can improve outcomes for patients with PAD

- Despite improvements, persistent clinical gaps were observed related to patient assessment and diagnosis, management of concomitant conditions such as diabetes, and the use of appropriate antithrombotic therapy

REFERENCES

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2. Medscape. Case Challenge in PAD: Role of Antithrombotic Protection. https://www.medscape.com/viewarticle/903518. Accessed February 27, 2020.

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