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Medscape, its members and the patients they serve thank you for your support of professional medical education, and we look forward to continuing success through future initiatives and innovative new methods of learning.

Sincerely,

Réjean Rochette Group Vice President rrochette@medscape.net



To learn more about MedSims, Medscape's innovative simulation platform, please visit: http://www.medscape.org/vision/medscape-medsims

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CARDIOLOGY

Title: Improving Clinical Management of VTE: Simulation in Continuing Education

Author: Jelena S. Spyropoulos, PhD, Medscape, LLC, New York, New York

Poster Presentation: Presented at ISTH SSC 2016 in Montpellier, France (May 2016)

IMPROVING CLINICAL MANAGEMENT OF VTE: Medscape SIMULATION IN CONTINUING EDUCATION

Jelena S. Spyropoulos, PhD, Medscape, LLC, New York, New York

Evidence-based anticoagulant therapy

preventable morbidity and mortality^{[4}

is often not implemented in patients with

This study was conducted to determine if an

venous thromboembolism (VTE), resulting in

online, simulation-based continuing medical

education (CME) intervention could improve the

performance of hematologists/oncologists and

cardiologists in managing patients with VTE^[5]

METHODS

- The intervention consisted of 2 patient case simulations presented in an advanced, interactive platform that replicates real-world experience (Figure 1)^[5]
- The format allowed learners to make decisions regarding lab tests, diagnoses, and treatments. Importantly, these decisions were not limited by nultiple choice; rather the platform's interface allowed any decision possible in the scope and depth of actual practice

RESULTS

BACKGROUND

Undergraduate and graduate medical

education programs are increasingly using

and its success has been well-documented

in continuing education is lagging. There

is a need to measure and document the

in the literature^[2,3]; however, use of simulation

effectiveness of simulation-based continuing

education in improving clinical decision making

imulation as an effective educational format^[1]

- The assessment sample consisted of 146 hematologists/oncologists and 216 cardiologists (Case 1) and 111 hematologists/oncologists and 160 cardiologists (Case 2) who made clinical decisions during the data collection period
- As a result of clinical guidance, significant absolute improvements were observed (Figure 2):
- 15% improvement in orders for the Geneva score for hematologists/ oncologists (51% post intervention vs 36% baseline; P =.004) and a 13% improvement for cardiologists (51% vs 38%; P =.002)
- 21% improvement in orders for the Simplified Pulmonary Embolism Severity Index (sPESI) score for hematologists/ oncologists (54% vs 33%; P <.001) and a 22% improvement for cardiologists (58% vs 36%; P <.001)
- 12% improvement in appropriate diagnosis of PE for hematologists/ oncologists (68% vs 56%; P <.001) and a 19% improvement for cardiologists (71% vs 52%; P <.001)
- 30% improvement in orders for a 3-week follow-up visit for hematologists/oncologists (55% vs 25%; P <.001) and a 20% improvement for cardiologists (74% vs 54%; P <.001)
- 18% improvement in orders to withhold rivaroxaban 24 hours prior to elective surgery for hematologists/oncologists (85% vs 67%; P =.001) and a 20% improvement for cardiologists (76% vs 56%; P <.001)
- 18% improvement in orders to resume rivaroxaban 24 hours postsurgery for hematologists/oncologists (85% vs 67%; P = .001) and a 27% improvement for cardiologists (75% vs 48%; P < .001)

40%

60%



2B. Clinical Decisions Related to Tailoring Treatment for VTE



2C. Clinical Decisions Related to the Use of Appropriate Antithrombotic Strategies for Managing Treatment of VTE



The clinical decisions made by each participant were analyzed using an artificial intelligence engine, and clinical guidance was provided based on current evidence and expert recommendation

- guidance and compared with baseline data using a 2-tailed, paired t-test to provide P values and assess the impact of education on clinical decisions
- RODUCTIO

Patient Case 1: Bev Med Sims

FIGURE 1. Patient Cases



CONCLUSION

- This study demonstrates that virtual simulation CME that immerses and engages the clinicians in an authentic, practical, and consequence-free learning experience can improve evidence-based practice decisions of specialists related to both diagnosis and treatment of patients with VTE, and suggests that this type of intervention can improve patient outcomes
- Despite significant improvements, ongoing educational gaps were uncovered related to:
- The use of validated scores to risk stratify patients for risk of PE
- Tailoring therapy for VTE based on patient and disease characteristics The use of patient-centered care strategies and interdisciplinary team coordination to improve management of patients with VTE

Acknowledaments

The educational intervention and outcomes measurement were funded through an independent educational grant from Janssen Pharmaceuticals, Inc. For more information, contact Jelena Spyropoulos, PhD, Director, Educational Strategy, Medscape, LLC, jspyropoulos@medscape.net.

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- Spyropoulos J, Spyropoulos AC. Improving evidence-based decisions in VTE treatme in continuing education. Presented at ISTH 2015; June 20-25, 2015; Toronto, Canada
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ABSTRACT #CA03

Participant decisions were collected after clinical

The activity launched on September 17, 2015, and data were collected through October 22, 2015





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CARDIOLOGY

Title: Improving Evidence-Based Decisions in SIHD Management: Simulation in Continuing Education Authors: Jelena S. Spyropoulos, PhD; Catherine C. Capparelli, CHCP: Medscape, LLC, New York, NY Poster Presentation: Presented at QCOR 2016 in Phoenix, AZ (February 2016)

Medscape IMPROVING EVIDENCE-BASED DECISIONS IN SIHD MANAGEMENT: SIMULATION IN CONTINUING EDUCATION Jelena S. Spyropoulos, PhD; Catherine C. Capparelli, CHCP Medscape, LLC, New York, NY FIGURE 3. Clinical decisions related to antianginal treatment INTRODUCTION METHODS RESULTS Case 01 Cardiologists n=537 As a result of CG, significant improvements were observed among cardiologists post-Angina secondary to stable ischemic heart The CME intervention consisted of 2 cases % Be 8% CG compared to pre-CG, related to patient assessment, diagnosis, and appropriate disease (SIHD) is the most common clinical presented in a platform that allowed learners Order: Step-I In Anti-Anginal Treatm treatment of SIHD (Figures 2, 3, and 4) presentation of cardiovascular disease to order laboratory tests, make diagnoses, and encountered by cardiologists1 determine treatments matching the scope and depth of actual practice However, guideline-directed medical FIGURE 2. Clinical decisions related to patient assessment and diagnosis therapy (GDMT) to manage angina is The clinical decisions made by the learners in open B Case 02 widely underused in patients with SIHD, field responses similar to electronic health records Cardiologists n=518 and patients are often misdiagnosed and were analyzed using an artificial intelligence engine, % B not managed appropriately² and clinical guidance (CG) was then provided based 18% A Case 01 Order: CCBs/Third-Ge P<.001 on current evidence and expert recommendation Beta-Blockers Learner decisions were collected after CG and % Behavior Change 🛛 % Pre Guidance GOALS Cardiologists n=537 compared with each user's baseline (pre-CG) data using a 2-tailed paired t-test to determine P values for assessing the impact of education on clinical This study was conducted to determine if an decisions FIGURE 4. Clinical decisions related to the use of patient-centered care Order: ECG online, simulation-based continuing medical An overview of the cases is provided in Figure¹ education (CME) intervention could improve the performance of cardiologists in the The activity launched on March 20, 2015, and data medical management of patients with SIHD A Case 01 were collected through April 2, 2015 SPEC Cardiologists n=53 Order: Patient Education & Co P<.001 % Behavior Change 🛛 % Pre G Order: Br FIGURE 1. Patient cases Patient Case 01: Ross G. Patient Case 02: Mary A. Cardiologists n=518 ⁶⁶ I've been having some new symptoms over the I've been having difficulty walking short distances. % Beh My shortness of breath hasn't improved over the past few weeks since my last visit. Order: Patient Education & Counceli 9 last month since I went to urgent care. **J** A 70-year-old man presents today with episodic chest B Case 02 A rogearbid man present to today with episodic trans pain and dyspnea on exertion (DOE), which he claims has possibly gotten worse during the past 2 weeks. He saw his physician assistant 2 months ago after 7 to 0 does of chable observation and electropped to know the Lauren is a 65-vear-old woman with a previou Lauren is a 65-year-old woman with a previous history of unstable angina diagnosed 3 years ago, which resulted in the placement of a coronary artery stent. Four weeks ago, she presented to an urgent care facility with new-onset dyspine ao exertion. Since then, her intermittent shortness with other services and the state of the state of the service of the ser Lauren J. Travis V. He saw his physician assistant 2 months ago after 7 10 days of stable chest pain and shortness of breat with exertion. At the time he was told that he may have angina, and a follow-up visit with a cardiologis was suggested after the patient refused to go to the emergency department (ED). Travis missed that cardiology apprivation to the hor horaximation % Behavior Change 🛛 % Pre G Cardiologists n=517 CONCLUSIONS Order: 2-D % P=.03 Echocardiog of breath, with some associated episodic chest pressure, has continued. Lauren confirms that these symptoms resolve within 5 minutes of rest. Order: EC cardiology appointment due to the bereavement of a close friend; this is his first visit for 2 months. Acknowledgments This study demonstrated that simulation-based CME with open-ended decision capability Order: Exercise SPECT 10% P<.001 This CME-certified activity was supported by an independent Patient Stats Current Conditions Patient Stats Current Condition can improve evidence-based practices of educational grant from Gilead Sciences Medical Affairs. Order: Fasting Lipid Pane cardiologists related to management of SIHD Age 65 Hypertension 2 years ago Age 70 Erectile dysfunction For more information, contact Jelena Spyropoulos, PhD, Director of including ordering appropriate tests, arriving 2 years ago Dyslipidemia Gender Female Gender Male Hypertension Clinical Strategy, Medscape, LLC at ispyropoulos@medscape.net. at the correct diagnosis, making the optimal Chronic kidnev Diabetes mellitus, type 2 Weight 72.00 kg Weight 90.00 kg 2 years ago Order: Seattle Angina treatment selection, and providing patientdisease, stage 3 Height 168 cm 182 cm Height centered care References Current Medications Current Medications BMI 25.5 BMI 27.2 Order: Brain In addition, ongoing educational gaps were 1. Go AS, Mozaffarian D, Roger VL, et al. Heart disease and stroke statistics - 2014 9% P= 003 Vardenafil natiuretic peptide update: a report from the American Heart Association. Circulation. 2013. 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GASTROENTEROLOGY

Title: Effect of Simulation-Based Medical Education on Improving Surgeons' Management of Short Bowel Syndrome

Authors: Jovana Lubarda, PhD; Piyali Chatterjee: Medscape, LLC, New York, NY Poster Presentation: Presented at DDW 2016 in San Diego, CA (May 2016)

Medscape

EFFECT OF SIMULATION-BASED MEDICAL EDUCATION ON IMPROVING SURGEONS' MANAGEMENT OF SHORT BOWEL SYNDROME

Authors: Jovana Lubarda, PhD, Piyali Chatterjee: Medscape Education, New York, NY

STUDY OBJECTIVES

Short bowel syndrome (SBS) is a condition in which bowel absorptive capacity is compromised and is associated with a significantly reduced mucosal surface and inability to maintain energy, fluid, electrolyte, or micronutrient balance through a conventional normal diet.⁽¹¹) SBS is common after extensive surgical section when residual bowel function does not allow for adequate

nutrition.^[2] Despite recent advances in SBS management, related guidelines have not been updated in nearly a decade, challenging clinicians to remain current in their management. This study aimed to determine if online medical simulation-based education could improve knowledge and competence of surgeons making clinical decisions in the management of SBS.^[3]

METHODS

- A CME activity was delivered online via MedSims, a virtual simulation-based learning platform that offers clinicians lifelike, point-of-care interactions through complete freedom of choice in clinical decision making, along with mentoring feedback to improve the learner's knowledge gaps
- Surgeons were presented with two patient cases of SBS designed to address current barriers such as patient monitoring/assessment for optimization of nutritional adaptation, selection of appropriate pharmacologic therapy as part of intestinal rehabilitation, and strategies to help improve patient adherence with dietary/nutritional requirements
- Following virtual introduction of patients, physicians were asked to select from

References

- numerous available assessments, strategies for patient dietary adherence, and pharmacologic therapies. The clinical decisions made by the participants were analyzed using artificial intelligence technology. Clinical guidance (CG) was provided employing current evidencebased recommendations through a decision engine in the simulation
- Impact of the education was measured by comparing participant decisions pre- and post-CG using a 2-tailed, paired t-test in which P <.05 was considered statistically</p>
- significant
- The activity was hosted on Medscape Education from October 30, 2014, and data were collected through February 17th, 2015

Patient case 1: From pre- to post-CG in the simulation, surgeons (n=159) were more likely to make evidence-based clinical decisions

RESULTS

- related to:
 Applying patient monitoring/assessment strategies to optimize nutritional adaptation in patients with SBS, such as ordering colonoscopy (19% pre-CG to 30% post-CG, *P* <.001), ordering methylmalonic acid, serum (16% pre-CG to 33% post-CG, *P* <.001), ordering upper gastrointestinal series (19% pre-CG to 37% post-CG, *P* <.001), and diagnosing small intestine bacterial overgrowth (4% pre-CG to 36% post-CG, *P* <.001) (Figure 1; Figure 1B)
- Selecting appropriate pharmacologic therapy, such as teduglutide, as part of intestinal rehabilitation in SBS (1% pre-CG to 32% improvement post-CG, P <.001) (Figure 1; Figure 1C)

Patient Case 1: Mike F.

Patient Stats

Age 25 years Gender Male Weight 74 kg Height 179 cm BMI 23.1

Allernie

FIGURE 1. Patient Case 1

ergocalciferol loperamide atropine-diphenoxylate Current Conditions lleal-colic anastomosi

"I'm hoping that I can get off these intravenous (IV) feedings

3 months ago 3 months ago 6 months ago 8 months ago 8 months ago

6 months ago

8 months ago

8 months ago

- Patient case 2: From pre- to post-CG in the simulation, gastroenterologists (n=186) were more likely to make evidence-based clinical decisions related to:
- Applying patient monitoring/assessment strategies to optimize nutritional adaptation in patients with SBS such as ordering methylmalonic acid, serum (25% pre-CG to 37% post-CG, P <0107, ordering upper gastrointestinal series (22% pre-CG to 33% post-CG, P <011), and ordering plasma citrulline (35% pre-CG to 45% post-CG, P <0.4) (Figure 2; Figure 2B)</p>
- Selecting appropriate pharmacologic therapy, such as teduglutide, as part of intestinal rehabilitation in SBS (1% pre-CG to 37% improvement post-CG,
- improvement post-CG, *P* <.001) (Figure 2; Figure 2C)

fer: Colonoscopy fer: Complete blood count (CBC) fer: Obspace blood count (CBC)

FIGURE 2. Patient Case 2 Patient Case 2: Clark G "I still have several loose stools each day and would like to try cutting down on the IV nutrition. year-old white man with a 20-year history of ileoc this office 9 months ago with 15 kg weight loss in Essential Decision 7 months ago 55 years azathioprine Gender Weight Height BMI Allergies Male 77 kg 178 cm 24.3 9 months ago 9 months ago loperamide opium Current Cond 20 years ago Crohn's disease 9 months ago Groshong catheter Start: Teduglutide Start: Teduglutide Short bowel syndrome 2 weeks ago Figure 1B. Patient Case 1 Assessment Decisions % Pre CG 🖉 % Post C 13% P=.274 5% P < .001 100% P = .363 2% P < .001 100% P = .107 14%



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CONCLUSIONS

Surgeons who participated in online medical simulation-based education significantly improved their clinical decision making in SBS management, including ordering appropriate tests and selecting treatments to support intestinal rehabilitation. Further education is needed to reinforce these principles as well as optimize nutritional adaptation to improve patient outcomes.



GASTROENTEROLOGY

Title: Improving Management of Short Bowel Syndrome through Simulation-Based Education Authors: Jovana Lubarda, PhD; Piyali Chatterjee; Douglas Blevins, MD; Martin Warters, MA: Medscape, LLC, New York, NY Poster Presentation: Presented at ACG 2015 in Honolulu, HI (October 2015)

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IMPROVING MANAGEMENT OF SHORT BOWEL SYNDROME THROUGH SIMULATION-BASED EDUCATION



Reference

- 1. Thompson JS. Rochling FA. Weseman RA. Mercer DF
- where P<0.05 was considered statistically significant.



P=.009

100%

80%

60%

43%

HEMATOLOGY/ONCOLOGY

Title: Simulation in Oncologic Care: Advancing Evidence-Based Decisions in the Management of Metastatic Castration-Resistant Prostate Cancer

Authors: Tara Herrmann, PhD; Douglas Blevins, MD; Martin Warters, MA: Medscape, LLC, New York, NY Poster Presentation: Presented at ASCO-GU 2016 in San Francisco, CA (January 2016)

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SIMULATION IN ONCOLOGIC CARE: ADVANCING EVIDENCE-BASED DECISIONS IN THE MANAGEMENT OF METASTATIC CASTRATION-RESISTANT PROSTATE CANCER

Tara Herrmann, PhD; Douglas Blevins, MD; Martin Warters, MA

Medscape, LLC, New York, NY, USA

METHODS

RESULTS

BACKGROUND

Each year more than 220,000 men will be diagnosed with prostate cancer in the United States.^[1] Many of these individuals will see their disease progress to metastatic castration-resistant prostate cancer (mCRPC).^[1] The management of mCRPC has significantly changed in recent years as advances in understanding this disease have opened new avenues for therapeutic development. As a result, appropriate treatment selection and sequencing are crucial to maximizing patient outcomes. A study was conducted to determine whether online simulationbased educational interventions to address underlying clinical practice gaps could improve clinical decisions of oncologists in the management of mCRPC.

A cohort of US-practicing oncologists who participated in an online simulation-based educational intervention was evaluated.^[2]

The intervention consisted of 2 cases (Figure 1) that:

- Were presented on an interactive, virtual, simulation-based learning platform incorporating a sophisticated decision engine that dynamically analyzes more than 1.2 billion possible diagnostic and treatment decisions; and
- Included an electronic health record with present and past history/physical exam.

During the course of the simulation, oncologist learners ordered appropriate tests to:

- Establish a diagnosis
- Assess severity of the disease, and
- Order appropriate treatments



Learners were able to assess each patient and choose from an extensive database of diagnostic and treatment possibilities matching the scope and depth of actual practice. Instantaneous clinical guidance was provided after analysis by the decision engine of open field responses at each decision point. The guidance was based on evidenceand guideline-based recommendations as well as faculty and drug database feedback.

Participant decisions at every point in the case were collected after clinical guidance and compared with each user's preguidance decisions, using a 2-tailed paired t-test to provide P values for assessing the impact of simulation-based education on the clinical decisions made by participants.

The activity launched on 2/25/2014: data were collected through 9/12/2014.

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The assessment sample consisted of 135 oncologists who made clinical decisions within the simulation and proceeded to the concluding debrief section. Analysis of specific orders by oncologists identified common regimen choices by learners in both cases (Figures 4 and 7). Although not shown, the most commonly cited reason for regimen selection

for each case was "better toxicity profile," In addition, as a result of clinical guidance provided through simulation. significant improvements were observed in several areas of management of patients with mCRPC. Specifically:

■ 17% increase in the selection of an evidence-based regimen in the first- line setting (Figure 2)

bone metastases (Figures 3 and 6)

first-line therapy (Figure 5)













HEMATOLOGY/ONCOLOGY

Title: Simulation in Continuing Professional Development in Oncologic Care: Advancing Evidence-based Decisions in the Management of HER2-Positive Metastatic Breast Cancer Authors: Tara Herrmann, PhD; Douglas Blevins, MD; Martin Warters, MA; Pamela Peters, PhD: Medscape, LLC, New York, NY Poster Presentation: Presented at SABCS 2015 in San Antonio, TX (December 2015)

RESULTS

Medscape

SIMULATION IN CONTINUING PROFESSIONAL DEVELOPMENT IN ONCOLOGIC CARE: ADVANCING EVIDENCE-BASED DECISIONS IN THE MANAGEMENT OF HER2-POSITIVE METASTATIC BREAST CANCER

33 to 39% improvement in the number of

for patients in case 1 and case (Figure 6)

(Figure 6)

25 to 33% more participants referred the patients.

oncologists who ordered adverse event counseling

for psychosocial counseling after clinical guidance

Tara Herrmann, PhD; Douglas Blevins, MD; Martin Warters, MA; Pamela Peters, PhD Medscape, LLC, New York, NY, USA

BACKGROUND

Breast cancer is the second leading cause of cancer death among women.¹ The growth factor receptor HER2 is overexpressed in 20% to 30% of invasive breast cancers, and use of HER2-targeted therapies have improved responses and survival in patients with metastatic breast cancer (MBC).² However, the choice of the most appropriate agents and their sequencing is crucial to maximizing beneficial patient outcomes. A study was conducted to determine if simulation-based educational interventions to address underlying clinical practice gaps could improve competence and performance of oncologists in the evidence-based management of HER2-positive breast cancer.

METHODS

A cohort of US-practicing oncologists who participated in an online simulation-based educational intervention was evaluated.

- The intervention consisted of two cases (Figure 1) presented on an interactive, virtual, simulation-based learning platform incorporating a sophisticated decision engine that dynamically analyzes more than 1.2 billion possible diagnostic and treatment decisions. Each case included an electronic health record with present and past history/physical exam. Oncologist learners were able to assess each patient and choose from an extensive database of diagnostic and treatment possibilities matching the scope and depth of actual practice.
- During the course of the simulation oncologist learners ordered appropriate tests to establish a diagnosis, assess severity of the disease, and order appropriate treatments. Instantaneous clinical guidance, including faculty and drug-database feedback, was provided after analysis by the decision engine of open field responses, at each decision point employing evidence-based and expert faculty ommendations.
- Participant decisions at every point in the case were collected after clinical guidance and compared with each user's pre-guidance decisions using a 2-tailed paired T-test to provide P values for assessing the impact of simulation-based education on the clinical decisions made by participants. The activity launched on 7/31/2014 and data collected through 12/4/2014.

% Pre CG % Post CG Oncologists n = 68, CG = Clinic % Pre CG 🖉 % Post CG Oncologists n = 68, CG = Clinical Guidance GURE 4. Evidence-Based Clinical Decision in a IGURE 5. Selected Treatment Regimens by Practicing Oncologists for a Patient with Progressive Patient with Progressive HER2-positive MBC HER2-positive MBC FIGURE 1 A. Case 1 Profile: Patient with Newly HER-2 Positive MBC B. Case 2 Profile: Patient with Progressive HER-2 MBC 12 2 Patient Case 02: Fern H. Patient Case 01: Opal R. Medications naproxen omeprazole hydrochlorothiazide Current Conditions Metastatic brewst ca Started 3 years ago 3 years ago 3 years ago 5 years ago 5 years ago 4 years ago 4 years ago Age Gender Weight Height BMI Allergies 55 years Female 72 kg 163 cm 27.1 None 43 years Female 58 kg 165 cm 21.3 None 1 week ago 3 years ago 3 years ago 3 years ago 4 years ago 5 years ago 6 years ago 7 years ago % Pre CG % Post CG Oncologists n = 55, CG = 📕 % Pre CG 📕 % Post CG

Other Choice

The assessment sample consisted of 123 oncologists who made clinical decisions within the simulation and proceeded to the concluding debrief section. aAalysis of specific orders by oncologists identified common regimen choices by learners in both cases (Figures 3 and 5). In addition, as a result of clinical guidance provided through simulation, significant improvements were observed in several areas of management of

FIGURE 2 Evidence-Based Clinical Decision in a

Patient with Newly Diagnosed HER2-positive MBC

35% improvement in the selection of the preferred treatment regimens (Figure 2)

patients with HER2-positive MBC, specifically:

21% improvement in evidence-based treatment selection for individuals whose disease progressed on first-line therapy (Figure 4)





References

November 11, 2015

November 11, 2015

Patient Stats Age Gender Weight Height BMI Allergies

CONCLUSIONS

This study showed improvements in evidencebased practice patterns of oncologists in selection and sequencing of therapeutic protocols for patients with HER2-positive MBC including appropriate selection of first and second line therapies. Thus, simulationbased instruction may be useful in improving oncologists' evidence-based clinical decisions in the management of MBC and therefore may play a role in improving the quality of care and patient outcomes. In addition, use of simulation was able to identify gaps remaining in oncologists' competence and performance in the management of HER2-positive MBC. Remaining gaps include selection of the most appropriate. evidence-based first line HER2-targeted regimen in patients with MBC, education of patients on potential treatment-related side effects, and addressing psychosocial issues.

Acknowledgments

This metastatic breast cancer simulation was funded through an independent educational grant from Genentech.

For more information, contact Tara Herrmann, PhD, Director, Educational Strategy, Medscape, LLC, therrmann@medscape.net

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IMMUNOLOGY

Title: Improving Clinical Decisions for Rheumatoid Arthritis Management Using Online Medical Simulations Authors: Nimish Mehta, PhD; Keith D. Johnson, MBA; Douglas Blevins, MD; Martin Warters, MA: Medscape, LLC, New York, NY

Poster Presentation: Presented at ACR/ARHP 2015 in San Francisco, CA (November 2015)

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IMPROVING CLINICAL DECISIONS FOR RHEUMATOID ARTHRITIS MANAGEMENT USING ONLINE MEDICAL SIMULATIONS

Nimish Mehta, PhD, MBA, Keith D. Johnson, MBA, Douglas Blevins, MD; Martin Warters, MA Medscape, LLC, New York, NY, USA

BACKGROUND

Undergraduate and graduate medical education programs are increasingly using simulation as an effective educational format,1 and their success has been well-documented in the literature; 23 however, use of simulation in continuing education s lagging. Moreover, in many patients with rheumatoid arthritis (RA), the disease is not adequately controlled, and only a ninority of patients attain the goal of consistent rem or low disease activity.⁴ Underlying clinical practice gaps and educational needs were identified, and a study was conducted to determine if online, simulation-based educational interventions could improve clinical decisions made by heumatologists regarding the management of patients with RA, including first-line and second-line biologic therapies.

METHODS

A cohort of practicing rheumatologists from several countries who participated in online, simulation-based education was evaluated.

Instructional Method

The simulation consisted of two cases presented in a platform that allowed physician learners to choose from numerous lab tests and assessment scales as well as thousands of diagnoses, treatments. and procedures matching the scope and depth of actual practice. An artificial intelligence engine dynamically analyzes more than 1.2 billion possible diagnostic and treatment decisions. This virtual electronic health record includes present and past history/physical exam and expects users to choose appropriate tests to establish a diagnosis, assess severity of the disease, and order appropriate treatments. Each action is recorded and evaluated, and real-time faculty- and drug-database feedback with selected references is provided. When appropriate, use of recent society guidelines and oversight through peer review are employed. This environment is well-suited to reinforce evidence-based recommendations and treatment plans while providing a genuine interactive adult learning experience and suggesting how clinicians are incorporating evidence-based recommendations into RA patient care.

Assessment Method

The clinical decisions made by the participants were analyzed using artificial intelligence engine, and instantaneous clinical guidance was provided, employing current evidence-based and expert faculty ndations on management of RA. Participant decisions were collected after clinical guidance (CG) and compared with each user's baseline data using a 2-tailed paired T-test (P<0.05 was considered statistically significant) to assess the impact of simulation-based education on the clinical decisions made by participants. Data reflective of learners who participated in the assessment from 10/29/14 to 4/29/15

RESULTS

The assessment sample consisted of 282 rheumatologists who made clinical decisions within the simulation and proceeded to the concluding, debrief section within the study period. As a result of clinical guidance (CG), significant improvements were observed in several areas of management in patients with RA (post-CG vs pre-CG, Figure 1 and Figure 2) specifically:

- 119% relative improvement in the identification of RA flare in a patient who had stopped MTX due to intolerance (P<.0001)
- 254% relative increase in selection of non-TNF biologic agent upon inadequate response to traditional DMARDs (P<.0001). Most of this improvement resulted from increase in tocilizumab monotherapy selection.
- 17% relative increase in correctly deciding to discontinue adalimumab (P<.02)
- 120% relative improvement in the decision to prescribe non-TNF biologic in an adalimumab non-responder (P<.0001). Most increase came from selection of tocilizumab, followed by abatacept and rituximab









Reference

CONCLUSIONS

This study demonstrated the success of online, simulation-based education on improving the evidence-based clinical decisions by rheumatologists in selecting appropriate treatment for first-line biologic and switching to second-line biologic agents. These metrics provide strong evidence that online, simulation-based instruction in continuing education that leads to improvement in physician performance in a consequence-free environment can result in more evidence-based clinical decisions for RA and improvement in patient outcomes

Acknowledgments

The educational interventions and outcomes measurement were funded through an independent educational grant from Genentech Inc.

For more information, contact Nimish Mehta, PhD, MBA, Senior Director, Team Lead, Strategy, Medscape, LLC, nmehta@medscape.net.

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IMMUNOLOGY

Background

Methods

INSTRUCTIONAL METHODS

Title: Simulation in Continuing Education: Improving Evidence-Based Decisions for Rheumatoid Arthritis Management Authors: Nimish Mehta, PhD; Douglas Blevins, MD; Martin Warters, MA: Medscape, LLC, New York, NY Poster Presentation: Presented at ACR/ARHP 2014 in Boston, MA (November 2014)

Simulation in Continuing Education: Improving Evidence-Based Decisions for Rheumatoid Arthritis Management

Nimish Mehta, PhD, MBA; Douglas Blevins, MD; Martin Warters, MA Medscape, LLC, New York, NY, USA



Assessment Methods

The clinical decisions made by the participants were analyzed using artificial intelligence technology, and instantaneous or delayed clinical guidance was provided, employing current evidence-based and expert faculty responses on management of RA. Participant decisions were collected after clinical guidance (CG) and compared with each user's baseline data using a 2-tailed paired T-test to provide P values for assessing the impact of simulation-based education on the clinical decisions made by participants.



Ö

Results

The assessment sample consisted of 185 rheumatologists who made at least 1 clinical decision within the simulation and proceeded to the end. As

IMMUNOLOGY

Title: Simulation-Based Education: Improving Evidence-Based Decisions for Cystic Fibrosis Management

Authors: Nimish Mehta, PhD; Catherine C. Capparelli, CCMEP: Medscape, LLC, New York, NY

Poster Presentation: Presented at NACFC 2014 in Atlanta, GA (October 2014)

Simulation-Based Education: Improving Evidence-Based Decisions for Cystic Fibrosis Management

NIMISH MEHTA, PHD, MBA; CATHERINE C. CAPPARELLI, CCMEP

Medscape, LLC, New York, NY, USA

OBJECTIVE

Medscape

Undergraduate and graduate medical education programs are increasingly using simulation-based education as an effective educational format,^[1] and the success of simulation-based medical education has been well documented in the literature.^[2,3] However, use of simulation in continuing education is lagging. There is a need to measure and document the effectiveness of simulation-based continuing education in improving clinical decision making. A study was conducted to determine if online, simulation-based continuing education interventions could improve the competence and performance of pulmonologists and infectious disease specialists in the management of patients with cystic fibrosis (CF).

METHODS

A simulation-based educational activity launched online on 4/26/2013 (<u>http://www.medscape.org/viewarticle/781917</u>). The intended goal of this activity was to improve clinicians' ability to apply the CF infection management guidelines in realistic patient scenarios, evaluate the importance of continued multimodal therapies for infection management in CF while introducing new treatments, and develop a plan to transition those patients moving from pediatric CF care teams while optimizing patient outcomes.

Instructional Method

A technologically advanced, interactive, simulation-based learning platform that is designed to replicate the real-life physician experience of treating patients was selected as the format to deliver this education. A true simulation where physicians may choose from numerous lab tests. diagnoses, drugs, and procedures, this unique approach dynamically analyzes diagnostic and treatment decisions using an artificial intelligence engine with more than 1.2 billion combinations. Learners proceed through a series of steps, including selecting a patient, viewing the presented complaint, reviewing medical history and electronic medical records, and ordering appropriate tests or procedures to assist in making a diagnosis and developing a treatment plan. Every preference indicated and action taken is recorded and evaluated, and real-time feedback is provided, including error alerts, suitability of choices, potential adverse effects, interactions, and alternative options, as well as cited references for further research. The authenticity of this experience provides a genuine interactive environment that engages physicians at a deeper level to create truly objective and realistic learning. This format, which includes 2 patient cases, is particularly well suited to reinforce evidence-based recommendations. This format was chosen because it offers a real evaluation of how clinicians are using evidence-based guidelines in patients with CF. An overview of the 2 cases is shown in Figures 1A and 1B, and the decision points corresponding to each learning objective are shown in Table 1.

RESULTS

Responses from a sample of 95 pulmonologists and infectious disease specialists who participated in the simulation-based educational interventions were evaluated. As a result of clinical guidance provided through simulation, significant improvements were observed in several areas of management of patients with CF, specifically (Figure 2):

- 24% improvement in identification of acute exacerbation related to CF (67% post intervention vs 43% baseline, P<.001)
- 33% improvement in identification of acute exacerbation related to bronchiectasis (41% post intervention vs 8% baseline, P<.001)
- 35% more participants correctly ordered therapy for Staphylococcus aureus infection (45% post intervention vs 10% baseline, P=.001)
- 31% improvement in counseling for infection control (45% post intervention vs 14% baseline, P<.001)
- 29% more participants correctly ordered therapy for Pseudomonas aeruginosa infection (47% post intervention vs 18% baseline, P<.001)

IGURE 1A Simulation Patient Case 01

Patient Case 01: Thad W.

"I've recently moved back to the city and I have more coughing, sputum, shortness of breath and weight loss."

The patient recently moved back to the area after having lived on the East Coast for the past 3 years. Prior to that time, he had been followed at our CF clinic for 7 years. He reports deteriorating health for the past 2 years with increased cough sputum production, dyspnea, and increased frequency of exacerbations of his bronchiectasis. He was last treated with intravenous antibiotics 3 months ago, at which time his chest symptoms and FEV1 initially improved following the IV treatment course but began to deteriorate shortly thereafter. He has lost about 15 pounds over the last year.

Medications

Patient State

Age Gender Weight Height BMI Allergies	33 Male 78.6 kg 182 cm 23.7 None	tobramycin sertraline phytonadione omeprazole albuterol	300 mg 25 mg 5 mg 20 mg 2.5mg	montelukast fluticasone-salmeterol dornase alfa azithromycin	10 mg 1 INH 2.5 mg 500 mg	
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table 1	Essential Decisions Mapped to	Learning Objectives
To demonstrate mastery of the lea	rning objectives, clinicians were expec	ted to make these decisions.
Learning Objectives	Essential Decisions – Case 01	Essential Decisions – Case
Apply the CF infection manage- ment guidelines in real-life patient scenarios	Order: Chest X-Ray Order: Pulmonary Function Tests Order: Sputum Gram Stain and Bacte- rial Cultures Diagnose: Bronchiectasis, Acute Ex- acerbation	Order: Chest X-Ray Order: Spetum Gram Stain an rial Cultures Order: Hb A1c Diagnose: Malabsorption Syn Diagnose: Acute Pulmonary E bation Order: Diabetes Diagnosis an agement in Cystic Fibrosis
Evaluate the importance of con- tinued multimodal therapies for infection management in CF while introducing new treatments	Order: Anti-Pseudomonomas aerugi- nosa Order: Methicillin-Sensitive Staphylo- coccus aureus (MSSA) Order: Inhaled Tobramycin/Aztreo- nam Order: Azithromycin	Order: Anti-Staphylococcus a Order: Anti-Pseudomonas ae Order: Azithromycin Order: Hypertonic Saline (7% zation
Develop a plan to transition those patients moving from pediatric CF care teams to adult CF care teams while optimizing patient outcomes	Order: CF Infection Control Counsel- ing in Patients with Cystic Fibrosis	Order: CF Infection Control C ing in Patients with Cystic Fil





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ounselbrosis

Assessment Method

A cohort of US-practicing pulmonologists and infectious disease specialists who participated in this simulation-based educational intervention was evaluated. The clinical decisions made by the participants were analyzed using artificial intelligence technology, and instantaneous or delayed clinical guidance was provided employing current evidence-based and expert faculty responses. Participant decisions were collected after clinical guidance and compared with each users' baseline data using a 2-tailed paired T-test ro provide *P* values for assessing the impact of simulationbased education on the clinical decisions made by participants.

CONCLUSIONS

Based on the statistically significant improvements in clinical decisions as a result of clinical guidance, this study demonstrated the success of simulation-based educational interventions on improving the evidence-based practice patterns of pulmonologists and infectious disease specialists in the management of patients with CF. These metrics provide strong evidence that online, simulation-based instruction in continuing education that leads to improvemment in physician performance in a consequence-free environment can result in more evidence-based clinical decisions for CF and improvement in patient outcomes.

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sducational interventions and outcomes measurement were funded through an independent educational gran Gilead Sciences. Poster layout was provided by Christopher Clarke and Jonathan Yan of Medscape Education. here information, contact Nimish Mehta, PhD, MBA, Senior Director, Educational Strategy, Medscape, LLC,



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IMMUNOLOGY

INFECTIOUS DISEASE

Title: HIV Prevention: A Case Study of Two Complementary Instructional Methods to Improve Provider **Competence and Performance**

> Authors: Catherine C. Capparelli, CHCP, Medscape, LLC, New York, NY; Sara S. Johnson, PhD, Pro-Change Behavior Systems, Inc., South Kingstown, RI; Simi T. Hurst, PhD, Medscape, LLC, New York, NY

Poster Presentation: Presented at ACEhp 2016 in National Harbor, MD (January 2016)

Medscape

HIV PREVENTION: A CASE STUDY OF TWO COMPLEMENTARY INSTRUCTIONAL METHODS TO IMPROVE PROVIDER COMPETENCE AND PERFORMANCE

Catherine C. Capparelli, CHCP¹; Sara S. Johnson, PhD²; Simi T. Hurst, PhD¹

¹Medscape Education, New York, NY; ²Pro-Change Behavior Systems, Inc., South Kingstown, RI

INTRODUCTION

- The HIV epidemic in the United States continues to be a major public health crisis.
- Approximately 1 in 6 individuals with HIV are not aware they are infected. [1]
- Every year there are an estimated 50,000 new cases of HIV infection in the United States.[1]
- Despite evidence demonstrating the effectiver of preexposure prophylaxis (PreP) in preventing the

METHODS

Matching pre- and post-participation outcomes data were collected from participants in 2 initial patient simulation cases, personalized learning (PL) activities, and 2 final patient simulation cases

Patient Simulation

- Each patient simulation activity was composed of 2 cases and used an advanced, interactive platform to replicate physicians' real-world experience in clinical decision making.
- An artificial intelligence engine analyzes billions of possible decision scenarios matching the scope and depth of actual practice and provides clinical guidance to learners individualized to their specific decisions.
- Every learner action taken is recorded and evaluated, and real-time clinical guidance is provided.
- Educational impact was assessed by comparing each participant's decisions after clinical guidance to that participant's baseline data: 2-tailed paired t-tests were used to calculate P values.

FIGURE 1. Baseline Patient Simulation Cases

on March 25, 2015: http



- is a gap in clinicians' ability to incorporate it into HIV prevention strategies.[2-8] This study evaluates the efficacy of baseline patient simulation cases, personalized curriculum recommendations, and final patient simulation
- cases in improving physician competence and performance regarding incorporation of HIV prevention strategies into clinical practice.

Data were collected from March 25 through June 30.

2015, for the first cases (Figure 1) and from June 25

through September 30, 2015, for the second set of

The online PL curriculum (Figure 2) uses a unique

competencies related to practicing evidence-based medicine and personalizing activity recommendations

based on identified learner gaps. After the results of a case-based clinical assessment, learners are prescribed

technology to assess each learner's individual

cases (Figure 3).

PL Curriculum

acquisition of HIV by people at risk, data show there

 As of November 19, 2015, a total of 17,913 healthcare professional learners (including 14,417 primary care physicians, Ob/Gyns, ID specialists and other physicians) have participated in these activities. For PL, results from the outcomes data are

RESULTS

- reflective of those physicians who completed all of the questions in the activities compared with each learner's self-assessment results.
- For patient simulations, outcomes data are based on pre- and post-clinical guidance for learners who corrected the clinical decision point.
- Both patient simulations and the PL interventions resulted in significant improvements across several key domains of patient care:
 - Recognizing risk for HIV acquisition (Figures 4A-C)
 - Performing appropriate lab assessm before PreP use (Figures 5A-C)
- Providing appropriate ongoing care and monitoring for patients receiving PreP (Figures 6A-C)

one or more specific activities that are mapped to identified gaps. Efficacy of the PL initiative was assessed using:

- McNemar's chi-square tests with continuity correctio for a binary dependent variable (in this case, "incorrect" vs "correct") in a within-subjects design in which the same individuals are measured twice. It is testing the consistency in responses across the pre- and posttest
- Relative percentage change is used to examine the percentage change in "percentage correct" across pre-and posttest answers using the following formula: [(% correct at post - % correct at pre) / % correct at pre]
- Conversion from incorrect to correct responses to determine the percentage of learners who answered incorrectly at pretest and correctly at posttest.
- Paired t-tests to determine whether there is a mean difference in clinicians' competence, performance, and skills before and after participating in each prescribed learning activity.
- Data were collected from May 29 to October 22, 2015.





HV Prevention: A Multipronged Approach

S & A A Prophylaxis: The PrEP Checklat

PrEP Orgoing Care

(1)

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Physician outcomes comparing self-assessment with post-test analysis on prituitien



<i>nily Practice</i> (n	= 418 PCPs)		B. PERSONALIZED LEARN PrEP: Ongoing Care	IING		C. PATIENT SIMULATIO Incorporating HIV Preve	N 2 ntion Strategie	s into Practice (r	1=202 PCP	s)
67% 23%	3%		A 56 year old man who has sex wi than 25 year history of multiple ST Which of the following assessment this patient?	th men and ha Is has recently ts would you p	as a more y started PrEP. perform for	Order: Follow-up Vait every 3 months Order: Follow-up: Order: Follow-up: Order: Follow-up 311 Screening	561 45%	91 18%		
225			PCPs (n = 183)*	Pre % (n)	Post % (n)	in 6 months	58		175	
20%	x		Renal function every 6 months		58.5 (107)	Order: Patient Education		3%	8%	
71%	9%		Renal function initially and annually thereafter	45.9	14.2	Order: Patient Education: Medication Adherence	47%	16%		
40%	60% 80%	100%								
			Sexually transmitted infection testing annually		6.0 (TT)	01	5 20%	40% 601	6 80%	
sicians Selecting priate Order(s)	Relative %	laralue	Sexually transmitted infection testing annually Tuberculosis at 6 months and annually thereafter	35.5 (65) 4.9 (9)	6.0 (TT) 1.1 (2)	01	% 20% % of Physicia Appropria	40% 601 ans Selecting te Order(s)	6 80% Relative %	0
icians Selecting riate Order(s) Il Post-Clinical Guidance	Relative % F	-value	Sexually transmitted intection testing annually Tuberculosis at 6 months and annually thereafter HIV, HBV, and HCV testing every 6 months	35.5 (65) 4.9 (9) N/A	6.0 (T) (2) (2) (37)	O' Order	6 20% % of Physicia Appropria Pre-Clinical Guidance	40% 601 ans Selecting te Order(s) Post-Clinical Guidance	6 80% Relative % change	P-val
icians Selecting riate Order(s) I Post-Clinical Guidance 69%	Relative % F	•value	Sexually transmitted infection testing annually Tuberculosis at 6 months and annually thereafter HIV, HBV, and HCV testing every 6 months XP(1) = 68.3, P < 0	35.5 (65) (9) N/A 01, OR =12.7	6.0 (1) (2) 20.2 (37)	Order Follow-up Appt in 3 months	% 20% % of Physicia Appropria Pre-Clinical Guidance 56%	40% 60% ans Selecting te Order(s) Post-Clinical Guidance 66%	6 80% Relative % change	P-val
icians Selecting riate Order(s) I Post-Clinical Guidance 69% 75%	Relative % change 50% ▲ 12% ▲	<001 .002	Sexually transmitted inflection testing annually Tuberculosis at 6 months and annually threeafter HIV, HBV, and HCV testing every 6 months X° (η = 68.3, P < 0	35.5 (65) 4.9 (9) N/A 01, OR =12.7	6.0 (1) 11 (2) 20.2 (37)	Order Follow-up Appt in 3 months CrCl at 6 months	5 20% % of Physicia Appropria Pre-Clinical Guidance 56% 45%	40% 60% ans Selecting te Order(s) Post-Clinical Guidance 66% 62%	6 80% Relative % change 17% ▲ 40% ▲	P-val
icians Selecting riate Order(s) I Post-Clinical Guidance 69% 75% 54%	Relative % change 50% A 12% A 74% A	 <001 .002 <001 	Sexually transmitted infection testing annually transmitted infection and the testing and the testing and the testing and the testing avery 6 months $X^{0}(t) = 68.3, P < 0$	35.5 (65) 4.9 (9) N/A 01, OR =12.7	60 (11) (2) 20.2 (37)	Order Follow-up Appt In 3 months CrCl at 6 months STI screening at 6 months	5 20% % of Physicit Appropria Pre-Clinical Guidance 56% 45% 58%	40% 60% ans Selecting te Order(s) Post-Clinical Guidance 66% 62% 70%	6 80% Relative % change 17% ▲ 40% ▲	P-val
cians Selecting riste Order(s) I Post-Clinical Guidance 69% 75% 54% 64%	Relative % change ₽ 50% ▲ 12% ▲ 74% ▲ 52% ▲	Avalue	Security transmitted inflection locating annually Tuberculosis at 6 months and annually thereafter HV, HBV, and HCV testing every 6 months $X^{(0)} = 68.3, P < 0$	35.5 (65) 4.9 (9) N/A 01, OR =12.7 56%	60 (1) (2) (2) (27) (27)	Order Follow-up Appt In 3 months CrCl at 6 months STI screening at 6 months SE Assessment	5 20% % of Physicit Appropria Pre-Cilnical Guidance 56% 45% 58% 40%	40% 60%	5 80% Relative % change 17% ▲ 40% ▲ 19% ▲	P-val
Alcans Selecting oriate Order(s) al Post-Clinical Guidance 69% 75% 64% 64% 64% 67%	Relative % change p 50% ▲ 12% ▲ 74% ▲ 52% ▲ 49% ▲ 32% ▲	Avalue <001 .002 <001 <001	Sexually transmitted infection testing annually transmitted and multiple constraints of 6 months and annually thereafter HV, HBV, and HCV testing every 6 months XV(t) = 68.8, P < 0 3271 Batalive	35.5 (65) (9) N/A 01, OR =12.7 55% Among those a	6.0 (m) 11 (2) 20.2 (27) answering	Crider Follow-up Appt in 3 months CrCl at 6 months STI screening at 6 months S2 Accessment Pattere Education & Councelling	5 20% % of Physicli Appropria Pre-Clinical Guidance 56% 45% 58% 40% 63%	40% 601 ans Selecting te Order(s) Post-Clinical Guidance 66% 62% 70% 59% 77%	6 80% Relative % change 17% ▲ 40% ▲ 19% ▲ 13% ▲	P-va 0.02 <00 <00

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- 8 Sharma M Wilton J Senn H Fowler S Tan DH Preparing for PrEP: perceptions

FIGURE 4. Educational Impact: Improved Recognition of Risk for HIV Acquisition B. PERSONALIZED LEARNING C. PATIENT SIMULATION 2 According to guidelines from the CDC, for which of the PCPs (n =112)* Pre % (n) Post % (r 67% 51% 🔺 <.001 135% 🔺 71% 13% 🛦 .045

FIGURE 5. Educational Impact: Improved Assessment Prior to PrEP Use

167% 🔺 <001

13% 🛦

47% 65% 38%▲ <.001

15%

A. PATIENT SIMULATION



C. PATIENT SIMUL Incorporating HIV F	ATION 2 Prevention Strat	tegies into Praci	tice (n=202 l	PCPs)
Order: Estimated Creatin Clearance (El	ine 4 CC)	9%	24%	
Order: MSM Risk In	Jex	65%	10%	
Order: Syphilis Serolog	les	73%	7%	
	0% 20%	40%	60% 80	75 100%
Order	% of Physic Appropria Pre-Clinical	ans Selecting ate Order(s) Post-Clinical	Relative % change	P-value
	Guidance	Guidance	104.	2000
MSM Risk Index	45%	72.%	158.4	014
Syphilis Serologies	73%	80%	9% 🛦	.049

the real-world use of PrEP in the United State

cessed November 9, 2014.

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rdant couples - assessment of attitudes, knowledge, and practices. AIDS Care. 2014;26:1435-1435 tiness of Canadian physicians for the implementation of HIV pre-exposure prophylaxis. PLoS One 2014;9:e10528

DISCUSSION

- The data demonstrate that patient simulations and PL curriculum improve evidence-based decision making.
- This multicomponent approach combined these two innovative educational platforms into a single curriculum to provide a comprehensive strategy that improved physicians' ability to appropriately incorporate HIV prevention strategies, particularly PreP, into clinical practice

Acknowledgements

This CME-certified activity was supported by an independent educational grant from Gilead Sciences Medical Affairs. For more information, contact Catherine C. Capparelli, CHCP. at ccapparelli@medscape.ne

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INFECTIOUS DISEASE

Title: High-Impact Education in Chronic HCV Infection Management: Expanding the Workforce and Improving Care

Authors: Catherine C. Capparelli, CHCP, Medscape, LLC, New York, NY; Sara S. Johnson, PhD, Pro-Change Behavior Systems, Inc., South Kingstown, RI; Simi T. Hurst, PhD, Medscape, LLC, New York, NY

Poster Presentation: Presented at ACEhp 2016 in National Harbor, MD (January 2016)

HIGH-IMPACT EDUCATION IN CHRONIC HCV INFECTION MANAGEMENT: EXPANDING THE WORKFORCE AND IMPROVING CARE

Catherine C. Capparelli, CHCP¹; Sara S. Johnson, PhD²; Simi T. Hurst, PhD¹

¹Medscape Education, New York, NY; ²Pro-Change Behavior Systems, Inc., South Kingstown, RI

INTRODUCTION

manage and cure hepatitis C (HCV), there is a growing need

their ability to appropriately assess and manage persons with

that only 10% to 18% of persons with chronic HCV infection are

nalized learning (PL) initiative on physician management

to expand the number of physicians who are competent in

Despite the significant public health burden, studies indicate

The purpose of this study was to determine the effect of an online curriculum of patient simulation cases and a

RESULTS

- As of November 19, 2015, 18,721 healthcare professional learners (including 15,687 physicians) have participated in these activities. Both patient simulations and the PL interventions resulted in significant improvements across several key domains of patient care for individuals with chronic HCV infection
- Specifically, physicians who participated in the educational interventions demonstrated substantial improvement in their ability to:
- Provide preventive care for patients with chronic HCV infection (Figures 4A-C) Evaluate patients before treatment (Figures 5A-C)
- Use appropriate testing to stage liver disease (Figures 6A-C)

A. PATIENT SIMULATION 1

HCV Infection (n = 241 PCPs)

A. PATIENT SIMULATION 1

Diagnose: Diagnose: (

Disasora Erashi

Diagnose: Child-Pugh A: Compensated

More Than Treatment: T Infection (n = 241 PCPs)

More Than Treatment: Timely As

Order: F

nent in Patients With Chronic

ecting inder(s) Relative % P-value change P-value

14%

53% 🛦

15% 🛦

Relative % change P-value

48% 🔺

54% 61% T3% **0**40

1% 27% 2600%▲ .<.001

4% 32% 700%▲ <001

12% 41% 242% 🔺 <001

The main purp patients with the following?

66% 75% 14% ▲ .021

46%

FIGURE 6. Educational Impact: Improved Assessment of Liver Disease

Prothrombin Time/International 37% 50% 35% ▲ .002

Hepatilis B Panels 60% 68% 13%
.051

29% 14%

12%

54%

30% 15%

METHODS

persona of HCV.

Medscape

Matching pre- and post-participation outcomes data were collected from 2 initial patient simulation cases, an asses based PL initiative, and 2 final patient simulation cases

As new treatment options be

chronic HCV infection 12

currently being treated.12

Patient Simulation

- Each patient simulation activity was composed of 2 cases and used an advanced, interactive platform to replicate physicians' real-world experience in clinical decision making.
- An artificial intelligence engine analyzes billions of possible decision scenarios matching the scope and depth of actual practice and provides clinical guidance o learners individualized to their specific decisions.
- Every learner decision was recorded and evaluated, and relevant real-time clinical guidance was provided.
- Educational impact was assessed by comparing each participant's decisions after clinical guidance with that participant's baseline data; 2-tailed paired -tests were used to calculate P values
- For patient simulations, outcomes data are based on comparison of decisions are based on comparison or decisions made pre- and post-clinical guidance to identify those learners who corrected initially incorrect decisions.
- Data were collected from March 25 through June 30, 2015, for the first cases (Figure 1), and from June 25 through September 30, 2015, for the second set of cases (Figure 3).

PL Curriculum

The online PL curriculum (Figure 2) uses a unique technology to assess each learner's individual competencies related to practicing evidence-based medicine. Following the results of this case-based clinical assessmen learners are prescribed one or more specific educational activities, each of which is mapped to an identified gap.

- For PL, the outcomes data reflect those physicians who completed all of the questions in the activities. Each learner's post-participation data were compared with that learner's self-assessment results to quantify learning.
- Data were collected from May 29 to October 22, 2015.

ases, More th The baseline patient simulation cases, More than Treatment: Timely Assessment in Patients With Ch HCV Infection, posted on March 26, 2015: http://www.medscape.org/viewarticle/840180 More Than Treatment: Timely Assessment in Patients With Chryster HCV Induction or Seastein a reporter measur partor Glad Sciences Netical Affair

FIGURE 1. Baseline Patient Simulation Cases





The self-assessment and PL initiative activities, *Initial* and Ongoing Patient Assessment in Chronic HCV: A Personalized Approach to Preparing a New Generation of HCV Care Providers, posted on June 11, 2015: http://www. medscape.org/personalized-learning/6006575



FIGURE 3. Final Patient Simulation Cases

The final patient simi cases, Ongoing Manag of Patients with Chronic HCV Infection, posted on June 15, 2015: http://www.medscape.org/viewarticle/842921 Ongoing Managame Patient Simulation atients With Chronic HCV Infection -





FIGURE 4. Educational Impact: Increased Provision of Preventive Care









DISCUSSION

- The patient simulation and PL curriculum have each been shown to improve evidence-based decision making.
- This multicomponent approach combined these 2 innovative educational platforms into a single curriculum to provide a comprehensive strategy that improved physicians' ability to appropriately incorporate initial assessment and treatment for persons with chronic HCV infection into clinical practice.

Acknowledgements

This CME-certified activity was spons by an independent educational grant from Gilead Sciences Medical Affairs. For more information, contact Catherine C. Capparelli, CHCP, at ccapparelli@medscape.net

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INSTRUCTIONAL DESIGN

Title: Innovative Use of Data to Inform Instructional Design: Patient Simulations Authors: Martin Warters, MA, Keno Vigil, Pamela M. Peters, PhD, Nimish Mehta, PhD, MBA, CHCP: Medscape, LLC, New York, NY Poster Presentation: Presented at the 2016 World Congress on CPD in San Diego, CA (March 2016)

INNOVATIVE USE OF DATA TO INFORM INSTRUCTIONAL DESIGN: PATIENT SIMULATIONS

Martin Warters, MA, Keno Vigil, Pamela M Peters, PhD, Nimish Mehta, PhD, MBA, CHCP Medscape Education, New York, NY

ORDERS

aspirin Pa

SYNOPSIS

Medscape

Virtual patient simulation (VPS) platforms bring healthcare providers from the classroom into a learning environment that more closely resembles clinical practice to better facilitate the transfer of new knowledge into patient care. These VPS platforms vary widely in their functional capabilities and therefore in their alignment with clinical practice.1 We present here an examination of how 1 capability was serially optimized and the outcome of that optimization

INTRODUCTION

Virtual patient simulation (VPS) is a relatively new, rapidly developing, teaching instrument with demonstrated effectiveness in medical education.² By using a simulated treatment setting that mirrors real-life clinical practice, recommended practice changes are brought more quickly to actual patient care.^{3,4} Despite this, there are little data available to inform optimization of VPS functional capabilities. MedSims the online VPS platform used in this study, requires the learner to order tests and interpret results. diagnose and/or stratify the patient's disease, establish a treatment managemen plan, and prescribe medication. Importantly learner actions and decisions are not limited by multiple choice options. A key feature of this VPS is the Prescription Pad, which replicates the clinical practice setting.

PURPOSE

This study was undertaken to optimize 1 VPS by following the established instructional development practices of iterative design, in which program capabilities are refined and optimized incrementally; each successive version is based on evaluation and feedback from the previous version. This study focused on the Prescription Pad function of the VPS simulation. Learnings from optimization of the Prescription Pad function will then inform best practice design for optimization of other VPS functions.

SPECIFIC FOCUS

As part of the ongoing improvement process and design iteration of MedSims, usergenerated engagement data were reviewed These data showed that many learners advanced through the VPS without prescribing treatments or medications despite a patient presentation that warrants prescription of a pharmaceutical or other therapy (Figure 1).

To address this issue

"Orders Helper"—a new functionality that targets the learners, skipping past the orders section—was incorporated into the VPS. As a result, in the 3 months following the addition, 81% of learners changed their behavior by deciding to revisit the orders page as a result of the Orders Helper. The remainder of this poster shows how an agile, successive approximation model (SAM) was utilized to optimize the Orders Helper function

METHODS

Quantitative and qualitative data on learner use of the VPS Prescription Pad function were collected from 3 primary sources

- learner outcomes from participation in successive iterations of the MedSims VPS platform
- 2. ad hoc feedback from internal stakeholders of the VPS platform
- 3. user outcomes from participation in simulations used in comparable high-stakes industries (eg, aviation, military, oil and gas industry)

A series of iterative improvements was made to optimize use of the Prescription Pad function. Learner behavior and outcomes data were collected from each iteration and used to inform the successive iteration (Figure 2).

FIGURE 2. Successive iterations to Orders Helper to improve Prescription Pad capability of VPS.



Baseline analyses showed that there was a relatively low level of learner engagement with the VPS Prescription Pad capability. The Orders Helper function was incorporated and shown to be successful in causing learners to revisit the Prescription Pad.

Iteration 1: Baseline addition of Orders Helper function

Orders Helpers were first incorporated into the VPS in March 2015 and took the form of pop-up windows that remained on the screen until a treatment was ordered.

In the 2 weeks following introduction of the Orders Helper, the percentage of learners using the Prescription Pad increased from 36.5% at baseline to 81% (N=3052). Despite this success, ad hoc feedback from internal stakeholders pointed out that since the popup windows stayed on the screen until a treatment was made, the function did not allow the learner to make the real-life decision of NOT prescribing a therapy.

Iteration 2: Timed disappearance of the **Orders Helper**

RESULTS

The second iteration provided for disappearance of the Orders Helper after 10 seconds, allowing the user to continue on with the simulation. Learner and stakeholder reviews indicated a perceived ambiguity about the intention to prescribe. likely due to the seemingly unpredictable disappearance of the Orders Helperlearners didn't know when the Helpe would disappear, which meant that the choice to proceed with prescribing was not always intentional. RDERS

Iteration 3: Addition of a requirement for active choice

To remedy perceived ambiguity that resulted from iteration 2, an additional pop-up window was added that required the learner to actively choose whether to revisit the Prescription Pad or to continue without doing so (Figure 3).

This window was positioned in the center of the darkened screen to optimize the user engagement and required an active choice whether to revisit the Prescription Pad or to proceed to the next step in the VPS. These changes removed choice ambiguity and ensured that learner behavior was captured in a way the represents the intention of the learner

Data generated by learners were reviewed to gauge the level of impact of the implementation of the new feature. In the 3 months following the Helper addition, 7789 learners saw the Orders Helper. From that group of learners, 6289 revisited the orders section. Thus, 81% of the learners changed their behavior by REVISITING the Orders section and making prescription decisions as a direct result of the Orders Helper (Figure 4).

FIGURE 1. The Orders section of the Prescription Pad

DISCUSSION

Although overall analysis showed this VPS to be very effective in educating physicians, analysis of individual VPS functions demonstrated underutilization of the Prescription Pad. By applying iterative improvements to the VPS, utilization was improved through addition and optimization of an Orders Helper.

A similar iterative process involving repetitions of the cycle of data analysis > introducing small changes ▶ analyzing the impact of those changes is an effective way to optimize functional capabilities of VPS environments.

FIGURE 3. MedSims pop-up window offers learners the option to revisit Prescription Pad or continue



FIGURE 4. The Orders section of the VPS after being revisited and completed by the learne



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METABOLIC

Title: Simulation-Based Medical Education: Strategy to Improve T2D Management? Authors: Amy Larkin, PharmD; Colleen Healy, MA; Martin Warters, MA: Medscape, LLC, New York, NY Poster Presentation: Presented at ENDO 2015 in San Diego, CA (March 2015)

Medscape

FRI-194 SIMULATION-BASED MEDICAL EDUCATION: STRATEGY TO IMPROVE T2D MANAGEMENT?

34

14% 20% 21% 17% 10% 9%

53% 7% 70%

Amy Larkin, PharmD; Colleen Healy, MA; Martin Warters MEDSCAPE EDUCATION, NEW YORK, NY

POTENTIAL CONFLICT MAY EXIST. REFER TO THE ABSTRACT.

Instructional Design: Patient Simulation/MedSims

ased recommendations in patients with T2D.

Activity: Achieving Glycemic Goals in Type 2 Diabetes: Factoring in Patient Concerns²

Patient Concerns² A technologically advanced, interactive, simulation-based learning platform that is designed to replicate the real-life physician experience of treating patients was selected as the format to deliver this education. A true simulation with virtual electronic health record where physicians may choose from numerous lab tests, diagnoses, pharmacologic treatments, and procedures, this unique approach dynamically analyzes diagnostic and treatment decisions and provides learners with feedback using a decision engine with more than 1.2 billion combinations. Learners proceed through a series of steps, every preference indicated and action taken is recorded and evaluated, and real time, formative, and summative feedback is provided. This format was chosen because it offers clinicians a real evaluation of how clinicians are using evidence-based recommendations in patients with T2D.

METHODS

TESTS

RESULTS

Demographics:

INTRODUCTION

Despite the availability of effectiv Despite the availability of effective antidiabets medications, only 58.8% of patients with type 2 diabetes (T2D) achieve the recommended treatment goal of glycated hemoglobin (HbA1c) less than 7%.¹ In updated mmendations, organizations cate the use of a wider range atments, including incretins, Ip patients achieve glycemic ol. A study was conducted to mine if online, simulationand educational interventions and improve competence and formance of endocrinologists and mary care physicians (PCPs) in

The MedSims User Experience

Endocrinologists PCPs (N=30) PARTICIPANTS (N=30) ARTICIPANT (N=70) NONPARTICIPANTS (N=70) 37 28 31 atients seen per week ith T2D, mean Number of patient per week with T2D 0% 13% 10% 10% 30% 10% 7% 0 1-10 0% 37% /% 21% 24% 20% 16% 6% 11-20 21-30 31-40 41-50 51-60 61-70 /% 20% 3% 13% 3% 17% Specialty Endocrinology Primary Care Family medicin. General Practica. Internal medicine 100% 100% 54% 4% 41%

Case #2

 A 45-year-old man presents with history of T2D for 4 years. severe gastroesophageal reflux disease (GERD) (contro with daily protein-protein interaction [PPI]), gout (controlled with allopurinol), and obesity Diabetes: initially treated with metformin for 6 months and

then with the addition of a sulfonylurea for the next year HbA1c, for which was initially 8.7%, fell to 7.8%

· Basal insulin for past 2 years, with a 30-pound weight gain (current weight 100 kg, BMI of 32 kg/m²) Patient titrated insulin to 40 units but experienced recurrent fasting hypoglycemia despite a current HbA_{1c} of

7.5% · Additional recent blood work shows an alanine aminotransferase (ATL) of 56 units/L and aspartate transaminase (AST) of 78 units/L



Overall:

Participants were 56.5% (actual effect size of d=1.03) more likely to make evidence-based practice choices than were a demographically matched group of nonparticipant physicians.

Case #1

- 60-year-old man presents for a routine office visit Past medical history: T2D currently treated with pioglitazone and
- basal insulin, hypertension treated with losartan and atenolol, hyperlipedemia (on lovastin), chronic renal insufficiency, and a history of a myocardial infarction (MI) 4 years ago that left him with a slightly reduced ejection fraction (EF) of 40%
- Previously tried glyburide but stopped due to hypoglycemia and lack of efficacy Social history: works as an insurance salesman, is mostly sedentary,
- relates no angina symptoms since his MI, stopped smoking immediately after his MI, now drinks alcohol only occasionally · Family history: brother has diabetes and is on hemodialysis
- Physical exam: blood pressure (BP), 150/100 mm Hg, body mass index (BMI), 33 kg/m² (increase from 29 kg/m² over past 4 years); clear lungs; trace pitting edema in lower extremities to the level of the ankle (due to pioglitazone)
- Laboratory findings: HbA1c, 9% (was 8.8% 3 months ago); creatinine, 2.2 mg/dL (creatinine clearance 28 mL/min); and low-density lipoprotein cholesterol (LDL-C), 102 mg/dL
- Self-monitoring of blood glucose (SMBG), 120 to 140 mg/dL; and occasional postprandial blood glucose (PPG), 200 to 240 mg/dL



Assessment Method: Clinical Case Vignettes The outcomes survey method included case-based, multiple-choice questions, previously validated to measure performance-level outcomes, based on current evidence-based recommendations for the assessment and management of patients with T2D. For performance level outcomes assessment, responses from the clinical cases and questions aligned to individual interventions were collected and compared with a matched group of nonparticipants (external control) in order to assess the impact of case-based education on the practice patterns of participants.

Statisitical Analysis: For the case-vignette questions, χ^2 tests were conducted to

detect significant differences between the participant and nonparticipant groups. The level of statisical significance for analytical tests was set at P<.05. Overall mean scores and pooled standard deviations were calculated for both the participant and nonparticipant groups. Educational effect size was calculated using Cohen's d.



\exists ω \bigcirc

Implications for Future Education

- Based on clinical practice gaps identified within the survey responses, future educational activities should focus on: Understanding the limitations of glucagon-like peptide-1 (GLP-1) receptor agonists in a patient with comorbid
- Recognizing the extra benefits that GLP-1 receptor agonists may play in improving a patient's weight
- Techniques for adding GLP-1 receptor agonists to a patient's regimen

Impact of Education on Patients:

The 3000 physician participants of this activity see, on average, 33 patients per week with T2D. Therefore, some 99,000 patients seen each week by participating physicians may benefit from improved care.

CONCLUSIONS

This activity demonstrated the success of simulation based educational interventions on improving the evidence-based practice patterns of endocrinologists and PCPs in the management of patients with T2D. Simulation-based instructions that lead to improvement in physician performance in a consequence-free environment can result in more evidence-based clinical decisions for T2D and improvement in patient outcomes.

This CME-certified activity was supported by an indepe educational grant from Bristol-Myers Squibb Company and AstraZeneca Pharmaceuticals LP.

For more information, contact Amy Larkin, PharmD, Director of Clinical Strategy, Medscape LLC, at alarkin@medscape.net.

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Scan here to view this poster online.



NEUROLOGY

Title: Simulation in Continuing Education: Improving Evidence-Based Decisions in Epilepsy Management Authors: Thomas F. Finnegan, PhD; Stacey Hughes; Douglas Blevins, MD; Martin Warters, MA: Medscape, LLC, New York, NY; Sheryl Haut, MD, MS, Department of Neurology, Albert Einstein College of Medicine, Bronx, NY

Poster Presentation: Presented at AES 2015 in Philadelphia, PA (December 2015)

Medscape

SIMULATION IN CONTINUING EDUCATION: IMPROVING EVIDENCE-BASED DECISIONS IN EPILEPSY MANAGEMENT

Thomas F. Finnegan, PhD¹; Stacey Hughes¹; Douglas Blevins, MD¹; Martin Warters, MA¹; Sheryl Haut, MD, MS²

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INTRODUCTION

In the United States, about 150,000 new cases of epilepsy are diagnosed each year. Epilepsy is associated with decreased quality of life, treatment-related adverse events, stigmatization, loss of self-esteem, and interference with social life.¹⁻³ Although epilepsy is highly prevalent, it remains a challenging disease to diagnose and treat effectively.^{4,5} In 2012, the Institute of Medicine (IOM) recommended improved education on epilepsy for healthcare providers so they may acquire the skills needed to provide "highquality, patient-centered, interdisciplinary care."4 Misdiagnoses of epilepsy in general. and of seizure types in particular, are all too common, in part because seizure severity and type may change over time in an individual patient.⁶ A study was conducted to determine if online, simulationbased continuing medical education could improve competence and performance of neurologists managing patients with epilepsy.

FIGURE 1. Patient profiles

An advanced simulation-based educational activity was launched online on 11/24/2014.7 The intended goal of this activity was to improve clinicians' ability to diagnose seizure types based on patient history, clinical presentation, and evaluation. An additional goal was to improve personalization of treatment choices based on seizure type and patient factors such as etiology, age, and comorbidities.

METHODS

A technologically advanced, interactive, simulation-based learning platform that is designed to replicate the real-life physician experience of treating patients was selected as the format to deliver this education. This unique platform dynamically analyzes diagnostic and treatment decisions using an artificial intelligence engine with more than 1.2 billion combinations, thus providing a clinically-relevant simulation in which physicians are not limited to preselected multiple choices of lab tests, diagnoses, drugs, and procedures. Learners proceed through a series of steps, including selecting a patient, viewing the presented complaint, reviewing medical history and electronic medical records, and ordering appropriate tests or procedures to assist in making a diagnosis and developing a treatment

plan. Every preference indicated and action taken is recorded and evaluated, and real-time feedback is provided, including error alerts, suitability of choices, potential adverse effects, interactions, and alternative options, as well as cited references for further clarification and education. The authenticity of this experience offers a snapshot of how clinicians are using evidence-based guidelines in care of patients with seizure disorders. An overview of the 2 cases is shown in Figures 1A and 1B, and the decision points corresponding to each learning objective are shown in Table 1.

Assessment Method:

The clinical decisions made by the participants were analyzed using an artificial intelligence engine, and instantaneous clinical guidance was provided, employing current evidence-based and expert faculty recommendations on management of epilepsy. Participant decisions were collected after clinical guidance (CG) and compared with each user's baseline data using a 2-tailed paired T-test (P<.05 was considered statistically significant) to assess the impact of simulation-based education on the clinical decisions made by participants. Data is reflective of learners who participated in the assessment from 11/24/14 to 02/24/15.

earning Objective

Recognize seizure types

based on patient history, clinical presentation, and

Tailor treatment with

and patient factors,

and comorbiditie

antiseizure medication

based on seizure type

including etiology, age

valuation

RESULTS

The assessment sample consisted of 335 neurologists who made clinical decisions within the simulation and proceeded to the concluding debrief section. As a result of CG provided through simulation, significant improvements were observed in several areas of management of patients with epilepsy, specifically (Figure 2):

- The number of participants who correctly diagnosed the patient with complex partial seizures with secondary generalization (56% post CG vs 15% baseline, P<.001; Figure 2A)
- Correct diagnosis of a patient with a cavernoma of the temporal lobe (53% post CG vs 9% baseline, P<.001; Figure 2A)
- Ordering an EEG in a sleep-deprived patient (63% post CG vs 39% baseline, P<.001; Figure 2A)
- Discontinuation of current treatment in a patient who experienced adverse events and poor medication adherence (35% CG vs 19% baseline, P<.001; Figure 2A)

Case 02

protocol

sclerosis

Order: lamotrigine, serum

Order: MRI with epilepsy

Order: pregnancy test

generalization

Diagnose: complex partia

seizures with secondary

Diagnose: mesial temporal

Continue: lamotrigine

Order: OB/GYN referral

Prescribe: at least 1 AED

used as adjunctive therapy

Order: EEG. 24-hour

TABLE 1. Essential Decisions Mapped to Learning Objective

Case 01

Order: carbamazepine

Order: levetiracetarr

Order: EEG; sleep deprived

Order: MRI with epilepsy

Diagnose: complex partial

seizures with secondary

serum levels

generalization

temporal lobe

daily dosing

levetiracetam

Discontinue:

Diagnose: cavernoma.

Prescribe: At least 1 AED

carbamazepine AND

epilepsy, preferably with 1x

approved for partial

protocol

clinical guidance. A Case 01



CONCLUSIONS

Correct selection of AED

vs 9% baseline P< 0.01

Ordering lamotrigine serum

levels in a patient currently

taking lamotrigine who still

experiences occasional seizures

and who wants to consider an

alternative treatment in order to

78% baseline, P=.033; Figure 2B)

interested in changing her AED

still gets occasional seizures

P=.001: Figure 2B)

Figure 2B)

After patient assessment,

diagnosing a patient with

complex partial seizures with

secondary generalization (56%

post CG vs 12% baseline, P<.001;

(68% post CG vs 56% baseline,

in order to start a family and who

start a family (83% post CG vs

Ordering an EEG in a patient

Figure 2A)

combination therapy involving at

least 1 medication that is dosed

daily in a patient experiencing

side effects and poor adherence

to current therapy (40% post CG

This study demonstrated the success of advanced simulationbased educational interventions on improving the evidencebased clinical decisions of neurologists in the management of patients with epilepsy. Simulation-based instructions that lead to improvement in physician performance in a consequence-free environment can result in more evidence-based clinical decisions for epilepsy and may lead to improvement in patient outcomes.

Acknowledgments

The educational intervention and outcomes measurement were funded through an independent educational grant from Eisai, Inc.

For more information, contact Thomas F. Finnegan, PhD, Associate Director, Educational Strategy, Medscape, LLC, tfinnegan@medscape.net.

0	I have bee and am fin medication	n having more seizure ding it hard to take all 1 daily. 🌗	es lately, of my	00	My husban worried ab and seizure	nd and I would like to out how my epilepsy es may interfere with	start a family. , its treatment my pregnanc
Ross G.	Ross G. is a 2 epilepsy start follow-up visi are becoming the results of visit 4 weeks levetiracetam	0-year-old man with a ing at age 14. He prese t stating that he feels th g more frequest and al- diagnostic tests order ago. He is currently be and carbamazepine a convulcion cinco bic la	history of ents today for a hat his seizures so to discuss ed at his last eing treated with ind reports that ct vicit	Mary A.	Mary A. is a 32 epilepsy and I past 15 years. well-controlled convulsions p vu. She and he family soon ar	2-year-old woman with has been taking lamotri She considers her seiz d, having only 1-2 break er year and monthly ep er husband are interest nd she presents today of her college unpaged	a history of igine (LTG) for ures moderate (through bisodes of deja ted in starting is to discuss what opent
	ne nas nad i	convuision since his la:	St VISIL		do internis or	nei epiiepsy managen	incrite.
Patient S	tats	Medications	Started	Patient St	tats	Medications	Started
Patient S Age	tats 20 years	Medications carbamazepine	Started 5 years ago	Patient St Age	tats 32 years	Medications Iamotrigine	Started 15 years
Patient S Age Gender Weight	tats 20 years Male 80 kg	Medications carbamazepine levetiracetam	Started 5 years ago 2 years ago	Patient St Age Gender Weight	tats 32 years Female 63 kg	Medications Iamotrigine mestranol- norethindrone	Started 15 years 14 days a
Patient S Age Gender Weight Height	tats 20 years Male 80 kg 179 cm	Medications carbamazepine levetiracetam Current Conditio	Started 5 years ago 2 years ago	Patient St Age Gender Weight Height	tats 32 years Female 63 kg 160 cm	Medications lamotrigine mestranol- norethindrone Prednisone	Started 15 years 14 days a 12 days a
Patient S Age Gender Weight Height BMI	tats 20 years Male 80 kg 179 cm 25.0	Medications carbamazepine levetiracetam Current Conditio Epilepsy	Started 5 years ago 2 years ago	Patient Si Age Gender Weight Height BMI	tats 32 years Female 63 kg 160 cm 24.6	Medications Iamotrigine mestranol- norethindrone Prednisone Current Conditie	Started 15 years 14 days 12 days ons

30

FIGURE 2. Comparison of clinical decisions before and after



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PULMONARY

Title: Simulation and Case-Based Education: Improving Evidence-Based Decisions for Pulmonary Arterial Hypertension Management Authors: Nimish Mehta, PhD; Catherine C. Capparelli, CCMEP: Medscape, LLC, New York, NY Poster Presentation: Presented at CHEST 2014 in Austin, TX (October 2014)

Simulation and Case-Based Education: Improving Evidence-Based **Decisions for Pulmonary Arterial Hypertension Management**

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Purpose

Outcomes for patients with pulmonary arterial hypertension (PAH) are often dismal, as diagnosis may be delayed for years following symptom onset.¹ Issues such as misdiagnosis, inadequate use of diagnostic and risk assessment tools, and delayed referral to PAH centers also contribute to poor outcomes. Moreover, despite guideline nendations urging frequent patient monitoring, follow-up care is often subopti Many patients experience a progressive deterioration of PAH without change or augmentation of therapy.² A study was conducted to determine if simulation and other online case-based educational interventions could improve competence and performance of pulmonologists and cardiologists with respect to the diagnosis, assessment, and management of PAH.

Methods

A cohort of US-practicing pulmonologists and cardiologists who participated in 1 of 3 case-based educational interventions was evaluated

INSTRUCTIONAL METHODS

Online educational activities were presented in 3 formats: patient simulation; text-based interactive case; and videoscenario vignettes with expert commentary highlighting clinician/patient interaction.³

This 5000-word interactive

text-based format included

2 patient cases that offered

as diagnostic charts and tests -- and posed questions

exploring the learner's current

knowledge and therapeutic

approach. Learners are

prompted to determine the appropriate treatment and follow-up for each patient. After each question, a carefully detailed, fully referenced

explanation of the most appropriate response is presented. By

detailed scenarios

Patient Simulation:

This interactive, simulation-based learning platform is designed to replicate the real-life physician experience of treating patients. Physicians choose from numerou lab tests, diagnoses, pharmacologic treatments, and procedures, and are provided with feedback using an artificial intelligence engine with more than 1.2 billion combinations Learners proceed through a series of steps, every preference indicated and action taken is recorded and evaluated, and real-time feedback is provided. This format was chosen because it allows for evaluation of how clinicians are using evidence-based recommendations in patients with PAH. (Figure 1)

combining a case-based format with 4-6 questions per case, this format "tests" learners' level of understanding on each item before delivering any education and "teaches" by correcting or reinforcing their existing understanding.

Assessment Methods

The outcomes survey methods included knowledge- and case-based, multiple-choice questions associated with current evidence-based mendations for the assessment and management of patients with PAH. For performance-level outcomes assessment, responses from the clinical cases and questions aligned to individual interventions were collected and compared with baseline data (internal control) or a matched group of nonparticipants (external control) in order to assess the impact of case-based education on the practice patterns of participants. Additionally, the clinical decisions made by the participants in the simulation activity were analyzed using artificial intelligence technology; participant decisions were collected after clinical guidance and compared with each user's baseline data using a 2-tailed paired T-test to provide Avalues for assessing the impact of simulation-based education on the clinical decisions made by participants.



evidence.

therapy is required, reflecting what clinicians may see in their daily clinical practice. This format was chosen to inspire development of new attitudes/perspectives, identify practical strategies, and model clinical decision making using a multimedia approach that complements, reinforces, and extends the reach of educational conten via an experience that aligns with real-world practice. Learners progress through video simulations -- professionally filmed and edited, and using skilled actors -- that showcase best practices in communication and experience embedded decision and performance queries, peer validation of responses, and expert observations supported by clinical

This visually dynamic activity

PAH for whom a decision on

format features a patient with

initiation and/or adjustment of



Assessment and management decisions for patients presented in simulation.

"I've been having some new and now worsening shortness of breath when I exercise."

Vitamin D2 50,000 international units (1.25 mg) weekly 10 months ago

Melodie B, is a 39-year-old white female who was referred for an initial evaluation after weckute Ls & 3-39-year-but write leniale with was reteried to all final evaluation an complaints of worsening dyspinea on exertion. She has a history of mixed connective tissue disease (MCID) for 5 years, with primary symptoms of arthraigias, leukopenia and Raynaud's, and has been very stable clinically until recently.

Started

6 years ago

6MWT = 6-minute walk test; CG = clinical guidance; RHC = right heart

Medications

nycophenolate mofetil 500 mg bid

FIGURE 1

Age 39 Gender Ferna Weight 60 kg

Height 168 c BMI 21.3

Gastroesonhadeal Relux Disease (GERD)

Mixed Connective Tissue Disease





Results

FIGURE 2

In total, more than 1000 pulmonologists and cardiologists were evaluated using fferent case-based educational interventions. Pulmonologists and cardiologists who participated in these educational formats were more likely to make evidencebased decisions compared to nonparticipants (simulation: 35% more likely, medium effect size of d=0.54; text-based interactive case: 34% more likely, medium effect size of d=0.52; video scenario vignettes: 47% more likely, relatively large effect size of d=0.78). Significant improvements were observed in several specific areas as a result of participation in these activities:

Characterizing a patient's REVEAL risk index (18% more participants vs nonparticipants, P = .05)

Selection of therapeutic regimen for a patient who is a nonresponder to vasodilator challenge.

Case Scenario: A 56-year-old woman presents to your office with the complaint of shortness of breath, particularly on exertion. She has noted slow but progressive development of this symptom over the past 6 months. She denies paroxysmal nocturnal dyspnea or orthopnea. From her history, you classify her World Health Organization (WHO) functional class. On physical exam she exhibits BP 114/74; HR 90/min; weight 60 kg; jugular venous pressure (IVP) 10 cm; heart regular rhythm; palpable left parasternal lift; S1 normal, S2 increased P2 component; grade 2/6 light systolic murmur; clear lungs; no peripheral clubbing or edema: oxygen saturation 91% at rest. An EKG shows normal sinus rhythm and right ventricular hypertrophy (RVH). Chest x-ray is normal. An echocardiogram eveals an estimated right ventricular systolic pressure (RVSP) of >65 mm Hg. A presumed diagnosis of PAH is made. Additional tests, including ventilation/ perfusion scan (V/O scan), brain natriuretic peptide (BNP), and pulmonary function tests (PFTs) are pending. You decide to perform a right heart catheterization on this patient to assess hemodynamics and confirm your diagnosis. Additional test results reveal the following: WHO functional class II, 6-minute walk >440 meters. BNP <50 pg/mL diffusing capacity of the lung for carbon monoxide (DLCO) >80% predicted. You determine that the patient's risk score is 9. The patient is a nonresponder to a vasodilator challenge.





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- Making appropriate assessment and treatment decisions in patient simulations (22% improvement in selecting oral therapies, P < .001; 21% improvement in selecting endothelin receptor antagonists [ERAs], P < .001 [Figure 1])
- Initiating ERA or phosphodiesterase 5 (PDE5) inhibitor therapy in a patient who is a der to vasodilator challenge (26% more participants vs nonparticipa P < .001 [Figure 2])
- Recognizing a patient's clinical decline and appropriately augmenting PAH therapy (13% more participants vs nonparticipants, P = .02 [Figure 3])

Conclusions and Clinical Implications:

This study demonstrated the success of simulation and other case-based educational interventions in improving the clinical decisions of pulmonologists and cardiologists in the assessment and treatment of patients with PAH. These metrics provide strong evidence that online case-based instruction that leads to improvement in physician performance in a consequence-free environment can result in more evidence-based clinical decisions for PAH treatment and improvement in patient outcomes.

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