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

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[2,3]; however, use of simulation in continuing education is lagging. Moreover, in many patients with rheumatoid arthritis (RA), the disease is not adequately controlled, and only a minority of patients attain the goal of consistent remission 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 competence and performance of rheumatologists in managing patients with RA.

Methods

A cohort of US-practicing rheumatologists who participated in 1 or more of 4 simulation-based educational interventions was evaluated.[5,6]

Instructional Methods

A unique interactive, virtual, simulation-based learning platform was selected to deliver this education. Physicians choose from numerous tests, diagnoses, drugs, and procedures as 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 includes 2 patient cases per program and 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. An overview of the 4 cases (2 programs) and clinical decisions captured are shown in Figure 1.

Assessment Methods

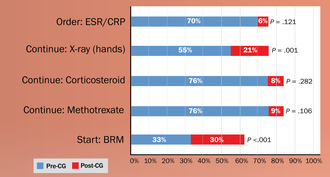
The clinical decisions made by the participants were analyzed using artificial intelligence technology, and instantaneous or delayed clinical guidance was provided, employing current evidence-based and expert faculty responses on management of RA. Participant decisions were collected after clinical guidance (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.

Figure 1 Simulation patient case profiles and clinical decisions

A

Patient Stats	
Patient ID:	MS65-01
Age:	62
Gender:	Female
Weight:	74 kg
Height:	156 cm
BMI:	30.4
Allergies:	None

Case 1: 62-year-old woman; known rheumatoid factor (RF) and RA; moderately symptomatic despite 4 months of naproxen, prednisone, and methotrexate. Presented 4 months ago with 6 months of increasing symmetric small-joint tenderness and swelling of hands, wrists, and feet. Joint exam today: minimal improvement, 18 tender/8 swollen joints. Erythrocyte sedimentation rate remains at about 40 mm/hour, and joint erosions are noted on x-rays.

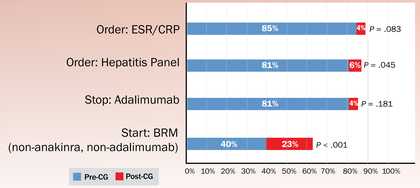


N=89 rheumatologists.
BRM = biologic response modifiers; CG = clinical guidance; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate.

B

Patient Stats	
Patient ID:	MS65-02
Age:	57
Gender:	Female
Weight:	95 kg
Height:	177cm
BMI:	30.3
Allergies:	None

Case 2: 57-year-old, obese, black woman, who has been treated for RA for past 7 years. Despite prednisone, methotrexate, and last 4 months on anti-tumor necrosis factor (TNF) agent adalimumab, she complains that current medications are not working (reoccurring joint pain and fatigue).

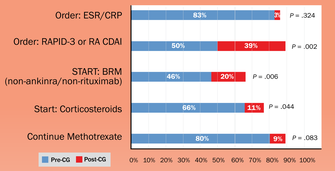


N=75 rheumatologists.
BRM = biologic response modifiers; CG = clinical guidance; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate.

C

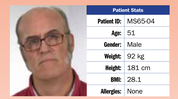
Patient Stats	
Patient ID:	MS65-03
Age:	41
Gender:	Female
Weight:	93 kg
Height:	167 cm
BMI:	33.3
Allergies:	sulfamethoxazole-trimethoprim

Case 3: 41-year-old woman; presented 6 months ago with 7 weeks of new onset RA. Since diagnosis, her RA symptoms have improved on naproxen, prednisone, and methotrexate, but she has new onset hyperglycemia and cannot taper the prednisone without worsening her joint symptoms (tenderness in 4 metacarpophalangeal/proximal interphalangeal joints and swelling in 3), fatigue, and morning stiffness. Today's Clinical Disease Activity Index (CDAI) shows moderate activity and Routine Assessment of Patient Index Data (RAPID-3) score is 5.3 (low disease severity).



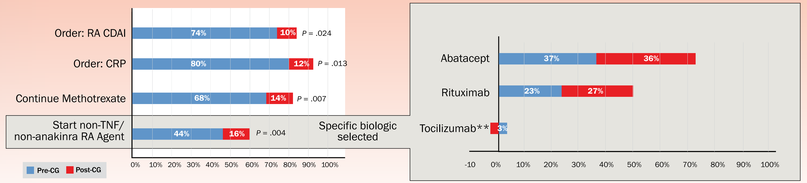
N=35 rheumatologists
BRM = biologic response modifiers; CG = clinical guidance; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; RAPID-3 = Routine Assessment of Patient Index Data; RA CDAI = Rheumatoid Arthritis Clinical Disease Activity Index.

D



Patient Stats	
Patient ID:	MS65-04
Age:	51
Gender:	Male
Weight:	92 kg
Height:	181 cm
BMI:	28.1
Allergies:	None

Case 4: 51-year-old man; history of hypertension, dyslipidemia, and RA. His RA symptoms have progressed despite 6 months of etanercept-methotrexate (MTX)-prednisone and more recently with 12 months of adalimumab-MTX and prednisone. Recently: several infectious disease episodes (including pneumonia). Today's C-reactive protein (CRP) is 13.70 mg/L, and his CDAI shows high disease activity.



N=50 rheumatologists
CG = clinical guidance; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; RA = rheumatoid arthritis; RA CDAI = Rheumatoid Arthritis Clinical Disease Activity Index; TNF = tumor necrosis factor.

N=30 rheumatologists.
CG = clinical guidance.

Results

The assessment sample consisted of 185 rheumatologists who made at least 1 clinical decision within the simulation and proceeded to the end. As a result of CG provided through simulation, significant improvements were observed in several areas of management of patients with RA, specifically:

- 30% improvement in the selection of a biologic agent in a patient with inadequate response to methotrexate (62% post intervention vs 30% baseline, *P* <.001) (Figure 1A);
- 11% improvement in recommendations for corticosteroids (77% post-intervention vs 66% baseline, *P* =.044) (Figure 1C);
- 39% more participants correctly ordered CDAI or RAPID-3 to determine the level of disease activity (89% post intervention vs 50% baseline, *P* =.002) (Figure 1C);
- 23% more participants selected an appropriate biologic in a patient failing an initial anti-TNF agent (63% post-intervention vs 40% baseline, *P* <.001) (Figure 1B); and
- 16% improvement in selection of non-TNF biologic agent in a patient with RA not adequately controlled on methotrexate plus trials of etanercept and then adalimumab (60% post-intervention vs 44% baseline; *P* =.004) (Figure 1D).

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 evidence-based practice patterns of rheumatologists in the management of patients with RA. 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.

References

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

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