Simulation Based Learning in internal medicine students

Apprentissage par simulation chez les étudiants de médecine interne

Melek Kechida[1], Syrine Daadaa[1], Wajdi Safi[1], Sonia Hammami[1], Ines Khochtali[1], Islem Ouanes[2]

1-Service de Médecine Interne et Endocrinologie, Faculté de Médecine de Monastir, Université de Monastir
2-Service de Réanimation Médicale, Faculté de Médecine de Monastir, Université de Monastir,

RÉSUMÉ

Introduction ; Peu d'expériences sont rapportées en apprentissage basé sur la simulation (ABS) en médecine interne.
Objectif : Evaluer l'impact de l'ABS dans l'apprentissage de la médecine interne sur la perception des apprenants, l'acquisition des connaissances et l'évaluation des compétences cognitives et de communication.
Méthodes : Étude observationnelle prospective réalisée dans le centre de simulation de la faculté de médecine de Monastir entre novembre 2018 et mars 2019. Des séances haute-fidélité étaient destinées au diagnostic de poussée lupique et des séances patient-standardisé pour l'éducation thérapeutique des patients sous anti-vitaminique K.
Résultats : Au total, 118 apprenants en pré-gradué répartis en 9 groupes ont assisté à 9 séances de ABS. En ce qui concerne la perception des apprenants, un gain de communication a été ressenti chez 117 apprenants (99,1%) et un gain de confiance chez 116 d'entre eux (98,3%). En ce qui concerne l'impact du ABS sur l'acquisition des connaissances, le score médian global avant et après le test était respectivement de 5,76 / 10 (4,61-6,92) et 7,69 / 10 (6,92-9,23) (p = 10-3). Le score d'amélioration global médian était de 2,3 (0,76-3,07). L'évaluation des compétences durant le scenario a permis de soulever les lacunes des apprenants sur lesquelles on a insisté dans le debriefing.
Conclusion : Selon notre étude, l'ABS a été associé à un niveau élevé de satisfaction des apprenants et a été efficace pour optimiser les connaissances et la communication dans la formation au diagnostic d'une poussée lupique et à la gestion des antivitamines K.
Mots clés: apprentissage basé sur la simulation; médecine interne; éducation thérapeutique; poussée lupique, antivitamine K

SUMMARY

Introduction : Few experiences have been reported in simulation-based learning (SBL) in internal medicine. Aim: To assess the SBL impact in internal medicine learning on learners' perception, knowledge acquisition, and cognitive and communication skills evaluation.
Methods : A prospective observational study conducted in the Simulation Center at the Faculty of Medicine of Monastir between November 2018 and March 2019. High fidelity sessions were intended for lupus flare diagnosis and a standardized patient session for therapeutic education of patients on antivitamin K treatment.
Results : A total of 118 third-year undergraduate medical learners split into 9 groups attended 9 SBL sessions. Regarding learners' perception, gain in communication was felt among 117 learners (99.1%) and gain in confidence among 116 of them (98.3%). As for SBL impact on knowledge acquisition, the overall median pre and post-test scores were 5.76 / 10 (4.61-6.92) and 7.69 / 10 (6.92-9.23) respectively (p = 10-3). The median overall improvement score was 2.3(0.76-3.07). Assessing learners' skills made it possible to highlight certain learners' shortcomings which we focused on during debriefing.
Conclusion : According to the current study, SBL was associated with a high level of learners' satisfaction and was effective in optimizing knowledge and communication in lupus flare diagnosis and antivitamin K management.
Key words: Simulation based learning; internal medicine; therapeutic education; lupus flare; antivitamin K therapy.

Correspondance
Melek Kechida
Service deMédecine Interne etEndocrinologie / Faculté deMédecine de Monastir,Université de Monastir
kechida_mel_lek@hotmail.com

INTRODUCTION

Simulation-based learning (SBL) is a booming educational tool which is recommended from initial medical training to continuing professional development (CPD) (1). Using SBL in critical care setting improved the quality of care provided to patients as it significantly reduced rates of iatrogenic infections complications and improved self-confidence and self-perceived competence in standardized procedural training (2). Furthermore, it helped to improve interprofessional collaboration between nurses and physicians (3).

SBL is largely associated with better knowledge acquisition and better cognitive skills achievement as it allows trainers to reshape their reasoning pattern and self-correct their knowledge (1, 4, 5)

Internal medicine is a rich and varied specialty based essentially on cognitive skills. However, few simulation experiments have been described in internal medicine learning even though SBL is a tool for learning and assessing cognitive skills.

Therefore, we thought that this discipline could benefit from SBL as initial and continuing training.

The objective of this work is to assess the impact of SBL in two different themes of internal medicine training on learners' perception, knowledge and cognitive acquisitions and communication skills.

METHODS

We conducted a prospective observational study in the Simulation Center at the Faculty of Medicine of Monastir between November 2018 and March 2019. Third year undergraduate medical learners (3YUGMD) enrolled in this study were already performing their training in the Internal Medicine Department at Fattouma Bourguiba University Hospital according to their curriculum of the academic year 2018-2019. The 3YUGMD were divided into groups of 15 learners each, for a 7-day training period. SBL was programmed weekly for 1 hour (every Monday) according to the classic sequence of a simulation session

Two SBL sessions were performed: one session of high fidelity SBL aiming to test learners about the diagnosis of systemic lupus erythematosus (SLE) flare associated to autoimmune hemolytic anemia and pleural effusion in a patient who presented to the Emergency Room for dyspnea and chest pain. The second was a standardized patient simulation session about therapeutic education of patients on antivitamin K treatment (AVK).

The high fidelity SBL session was performed on a SimMan 3G® (Laerdal) patient simulator, operated in a separate control room where the operator can view the progress of the scenario and make changes to the simulator as the session progresses. The scenario was performed in a realistic environment mimicking the emergency room.

The standardized patient simulation session was performed in a separate room mimicking an outpatient consultation.

Each simulation session began with a pre-test, related to the SLE or AVK scenario depending on the theme of the session. Then a briefing allowed the trainer to specify the framework of the session, its objectives, and principles of confidentiality. The pre-briefing allows participants to know the tasks to be carried out.

For each simulation session, a group of participants performed the scenario, and the other learners attended the participants' intervention in the neighboring debriefing room via an audio and video transmission system.There were 10 participants (16.7%) who actively participated in the AVK scenario throughout all the sessions (1 participant acts as the doctor and the other as the patient) and 12 participants (20.7%) who actively participated in the SLE scenario (1 participant acts as the patient, the other as a doctor and the third as a nurse facilitator).

At the end, a collective debriefing was aimed at providing a constructive feedback to the learners. Learners' cognitive and communication skills were assessed on participants acting as a doctor, using a pre-established grid filled in by the trainer during the scenario. The tasks needed to be carried out for each scenario were checked if not done, correctly or incorrectly done. For the AVK scenario we assessed how the participants greeted the patient, took the history, how they explained dosage and modality of treatment intake, treatment duration, doing exercise and food interaction. Regarding SLE scenario, we assessed greeting of the patient, history taking, work-up prescription, peripheral venous pathway setting up, oxygen prescription, blood count interpretation and indicating hospitalization. The educational impact of SBL on knowledge was assessed by a pre and a post five multiple choice questions at the beginning and at the end of the session according to the

theme of the session. A score out of 10 was calculated for both the pre and post-test. The delta-test calculated was the difference of both the post and the pre-test assessing the improvement score. The learners' perception was assessed by a questionnaire assessing satisfaction by a Likert scale at the end of the session.

Statistical analysis:

The Wilcoxon test for non-parametric related variables was used to compare pre and post-test improvement. A Student's t-test was performed to compare the means and Chi 2 test was carried out to compare the percentages. The U-Mann Whitney test was used to compare independent non-parametric variables. A p value smaller than 0.05 was considered as significant. The SPSS software (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp) was used for statistical analyses.

RESULTS

A total of 118 3YUGMD divided into 9 groups were enrolled. There were 97 females (73%) and 31 males (27%). Five sessions for AVK scenario and 4 sessions for SLE scenario were carried out. A total of 109 questionnaires for the learner's perception (92.3%), 109 pre-tests (92.3%), 118 post-tests (100%) and 118 satisfaction questionnaires (100%) were analyzed. All the participants had already attended a SBL session during a former training. A total of 22 learners (18.6%) actively participated in one of the sessions (Table 1).

Skills during scenario

For trainees who actively participated in the scenario, the learners' cognitive and communication skills were assessed during the scenario using a pre-established grid filled in by the trainer. For the AVK scenario, all the participants acting as a doctor (n=5) correctly greeted and taken the patient history. No one explained the modality of treatment intake. The results of the other items checked during the scenario are described in table 2.

Regarding the SLE scenario, greeting and taking history were correctly done by all the participants who acted as a doctor, as well as oxygen prescription. The items related to work-up prescription and interpretation are summarized in table 3.

Table 1. Baseline characteristics of the participants

	AVK session (n= 60)	SLE session (n=58)	Total (n=118)
Sex-ratio (M/F)	16/44	15/43	31/97
Mean age in years (range)	26 (25-27)	26 (25-28)	26(25-28)
Active participation in the scenario (n)(%)	10 (16.7)	12 (20.7)	22 (18.6)

Table 2. cognitive and communication skills assessment in AVK scenario

	Active participationas adoctorin AVK session (n=5)		
Item	Not done	Incorrectly done	Done
Greeting (n)	0	0	5
Taking history (n)	0	0	5
Modality of treatmentintake (n)	5	0	0
Treatment duration (n)	0	2	3
Dosage (n)	3	2	0
Physical activity (n)	0	4	1
Food interaction (n)	2	2	1

Table 3. cognitive and communication skills assessment in Lupus scenario

	Active participationas adoctor in SLE session (n=4)	
Item	Done	Not done
Greeting	4	0
Taking history	4	0
Patient conditioning		
- Oxygen prescription	4	0
- Venous route prescription	3	1
Work up prescription		
- Blood gas	3	1
- Chest x rays	4	0
- Electrocardiogram	3	0
- Blood count	4	0
- Hemolysis assessment	0	4
Hospitalisation indication	4	0

Knowledge and communication acquisitions

Regarding the educational impact of SBL on knowledge, the overall median pre-test score regardless of the scenario was 5.76 (4.61-6.92) against 7.69 (6.92-9.23) at the post test with a significant difference (p=0.001) (figure 1). The median overall improvement score was 2.3(0.76-3.07).

According to the scenario, the overall pre-test score for the AVK scenario was 5.76 (4.61-7.5) against 8.84 (7.69-9.23) (p = 0.001) with a median delta test of 2.3 (0.7-4.42). For SLE scenario, the overall pre-test score was 5.76 (4.61-6.92) compared to 6.92 (5.57-8.46) (p=0.001) with a median delta test 1.53 (0-2.3). The improvement score was significantly greater after AVK scenario compared to th

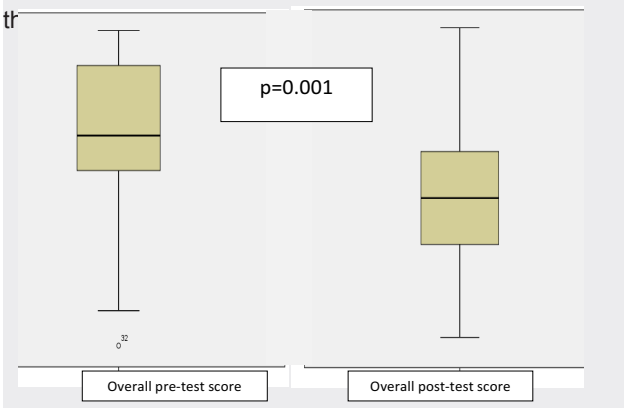

Figure 1 : comparative overall median pre-test and post-tes

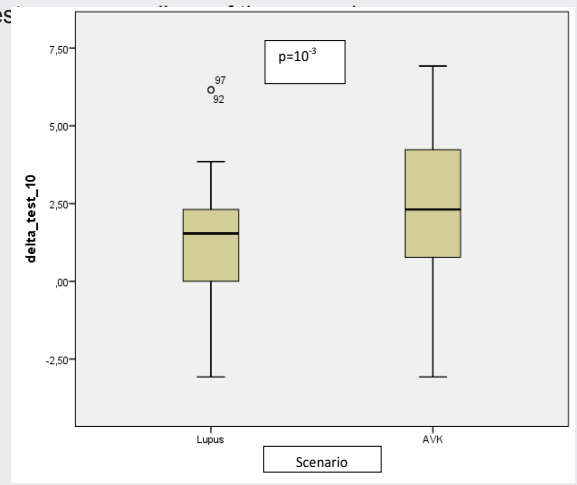

Figure 2: comparative improvement scores according to the type of scenario

Learners' perceptions

Among the learners, 108 (91.5%) felt that the proposed scenario was appropriate for their training, 102 (86.4%) believed that it would influence their current practice, 94 (79.7%) found that the exercise was difficult (45 for the AVK scenario: 47.9%, and 49 after the SLE scenario: 52.1%), 87 (73.7%) found the clinical situation realistic and 88 (76.5%) found that debriefing provided them with knowledge benefits.

According to the learners' self-assessment, a gain in communication was felt among 117 learners (99.1%) and a gain in confidence among 116 of them (98.3%).

DISCUSSION

In the present study, we observed a favorable learners' perception of SBL in two fields of internal medicine, with a communication gain among 117 learners (99.1%) and a confidence gain in 116 (98.3%). Regarding SBL impact on knowledge acquisition, the overall median pre and post-test scores were 5.76 / 10 (4.61-6.92) and 7.69 / 10 (6.92-9.23) respectively (p = 0.001). The median overall improvement score was 2.3 (0.76-3.07).

To the best of our knowledge, this is the first study on SBL in the Tunisian internal medicine curriculum assessing level 1 and level 2 of Kirkpatrick Model (6) with a focus on learners' perception, knowledge, cognitive and communication skills acquisitions. According to our results, SBL improved knowledge, cognitive and communication skills as the overall median improvement score significantly increased at the end of the session. As for learners' perception, it was found that SBL in internal medicine is worthy and useful.

Few studies dealt with SBL in internal medicine training, focusing mainly on improving the trainees' confidence and skills in procedural simulation tasks like cardiopulmonary examination, acute coronary syndrome management and advanced cardiac support curriculum (7, 8). Other studies focused on studying resident-nurse collaboration reasoning in acute situations or disclosing medical errors, using standardized patients simulations (1, 2). However, few studies have been published attesting its usefulness in internal medicine, although the latter is a rich and varied

specialty based on cognitive skills. Thus, internal medicine could benefit from several types of simulations.

Although simulation integration in educational programs of health professionals has been recommended since 2012(9), the first French experience of simulation in internal medicine curriculum was only reported in 2017(10). Like our study they performed two SBL sessions on two different topics: management of acute dyspnea and management of acute purpura. Two procedural simulation workshops were also designed on central airway intubation and lumbar puncture. At the end of the study they concluded at the potential interest of high-fidelity simulation in internal medicine curriculum, as they demonstrated educational impact of simulation on participants and learners satisfaction, in lines with our findings.

The standardized patient simulation would provide the ideal environment for learning semiological elements rarely encountered in hospital setting such as scleroderma. Moreover it allows the structuring of taking a patient history, learning how to announce a bad diagnosis or how to manage a non-compliant patient (11). The procedural simulators allow basic skills learning like suturing, or lumbar puncture. Unfortunately, some procedures do not have dedicated simulators like bone marrow aspiration or salivary glands biopsy. High fidelity simulation provides learners with repetitive and deliberate practice in a realistic and interactive environment, reproducing acute situations, enabling thus young people to learn the rapid assessment of a serious situation and to guide care (1). Viewing an audio video recording of its own performance during debriefing provides insight in its own mis-steps and gives a valuable feedback (12). Given all these benefits, there is a great interest in spreading SBL in internal medicine learning and implementing it in the national curriculum (5).

Nevertheless, this study has several limitations. First, we performed two different SBL scenario: a high fidelity SBL and a standardized patient simulation session dealing with two different topics: diagnosing SLE flare associated to autoimmune hemolytic anemia and pleural effusion in a patient who presented to the Emergency Room for dyspnea and chest pain and therapeutic education of patients on AVK treatment, respectively. Therefore, it would be difficult to have the same conclusions on all the participants. Second, knowledge and communication acquisitions and learners' perceptions were studied in all the participants, trainers who actively participated in the scenario as well as those who attended the participants' intervention in the neighboring debriefing room. This could represent a bias in results interpretation and could be the topic of another study aiming at comparing the impact of SBL on active participants and those attending the scenario without active participation.

At the end of this study, regardless of these limits, SBL is worthy and useful in initial internal medicine learning and it would also be interesting to assess its impact on residents.

CONCLUSION

SBL is increasingly recognized as a useful training tool in healthcare curriculum. As a rich and varied discipline based essentially on cognitive and analytic skills, internal medicine should benefit from this tool. This study showed that SBL was associated with high level of learners' satisfaction and was effective in optimizing knowledge and communication during pregraduate training. Assessing its impact on residents with other studies may contribute to implementing it in the national curriculum.

Ethical approval: ethical approval has been obtained from the independent ethics committee of the Faculty of Medicine of Monastir

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