

Continuous Multidimensional Assessment System of Medical Residents in Teaching Hospitals

mehdi yousefi

Mashhad University of Medical Sciences

zahra ebrahimi

Islamic Azad University North Tehran Branch

ali khorsand vakilzadeh

Mashhad University of Medical Sciences

somayeh fazaeli

Mashhad University of Medical Sciences

atousa ariafar

Mashhad University of Medical Sciences

mohammad tayyebi

Mashhad University of Medical Sciences

leila mashhadi (✉ ebrahimi646690@gmail.com)

Mashhad University of Medical Sciences

Research Article

Keywords: Evaluation, Medical education, Medical resident, Multidimensional, Students

Posted Date: May 11th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-490652/v1>

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Version of Record: A version of this preprint was published at Health Science Reports on April 1st, 2022.

See the published version at <https://doi.org/10.1002/hsr2.573>.

Abstract

Background

One of the most important principles in education, especially in clinical fields, is the evaluation of learners. Proper and continuous assessment can be used to provide appropriate feedback to students about their strengths and weaknesses. In this regard, the study aimed to design a system of continuous assessment of medical residents (SCMAR).

Methods

This study was performed using a combination of qualitative methods, including focus group discussion sessions and expert group meetings. The study population consisted of all the stakeholders involved in the learner evaluation process in Imam Reza Hospital Complex (IRHC) in Iran. This study was conducted in four steps, including identification of sub-axes and indicators through focus group discussions, review and approval of axes, sub-axes, and indicators in expert group meetings, model design by the research management team, and finally, agreement on sub-axes and indicators. Data analysis was performed during the agreement review stage in Excel software (2016 version).

Results

The finalized SCMAR consists of 10 main axes and 35 sub-axes. The axes include objectives, evaluators, areas and indicators of evaluation, evaluation periods, evaluation requirements, data collection, data sources, point assignment and data analysis methods, reporting, and feedback dissemination methods. Regarding areas and indicators of evaluation, 5 areas and 11 indicators were proposed.

Conclusion

A comprehensive evaluation system that continuously reviews the performance and professional behavior of learners can be used as a stimulus to improve the quality of delivered service and educational processes. The present study aimed to address this need by designing a framework.

Introduction

In the last 20 years, there have been very obvious changes in the research and development of assessment methods (1). Students play a crucial role in the improvement of the performance of the educational and treatment system. Moreover, they are responsible for the treatment of patients, especially in unconventional shifts, in medical education centers. Therefore, improvement of the performance of medical students is a serious concern for executive officials and experts (2). In this regard, one of the most important and challenging issues in clinical education is student evaluation (3).

Proper assessment helps identify the strengths and weaknesses of education and take steps to reform the educational system by strengthening the positive aspects and eliminating the shortcomings (4). Furthermore, clinical evaluation of students through direct observation in practical and real situations will guarantee their ability to cope and predict clinical events in specific patient conditions (5). Lack of continuous assessment in educational systems causes stagnation (6). Clinical assessment methods that are accompanied by feedback promote learning and are able to evaluate the student in areas that are difficult to evaluate by traditional methods (7).

Studies performed by Ogunyemi et al., Goldstein et al., and Stark et al. about the assessment of the professional skills and behavioral competence of residents suggest that assessment requires more than one group of evaluators (8–10). In other words, different groups need to be involved in the assessment (11, 12). Moreover, to improve and enhance the quality of clinical education, its status should be constantly evaluated (13).

According to the above-mentioned factors, a desirable method should continuously assess the learners and guarantee the participation of all stakeholders in the process while giving them feedback on the evaluation results. In this regard, IRHC in Mashhad, Iran, as one of the main teaching hospitals in Iran, has addressed this need and started to modify the relevant indicators and processes. Therefore, due to the importance of assessment based on integrated indicators and the need to facilitate and accelerate access to the collected information, IRHC decided to design and implement a SCMAR. Hence, the education and treatment managers of the hospital started to design and implement a SCMAR to reduce the problems.

Materials And Methods

This study was conducted using a combination of qualitative methods, including focus group discussion sessions and expert group meetings. The research environment was IRHC in Mashhad. It has approximately 1,000 beds and provides services for more than 6,000 hospitalized patients and about 19,000 patients who refer to the Emergency Department per month. There are approximately 300 faculty members and 500 students in various fields of medicine in this complex.

The present study was conducted in four basic steps. The research population in all steps included all stakeholders involved in the assessment of medical students, including residents, senior hospital managers, heads of clinical departments, head nurses, faculty members, educational service experts, and related individuals in the medical school.

Step one

The main goal in the first step was to identify the sub-axes and indicators and the main research method in this step was focus group discussions with stakeholders involved in the learner assessment process. Members of the focus group discussion included six medical residents, education and health deputy of the hospital, head of the educational services department of the hospital, and two head nurses in the

wards with the highest number of assistants. In total, three two-hour sessions were held, and the most important indicators of educational accreditation standards and also, after reviewing the related literature in the focus group discussions, the requirements of clinical ethics and performance of medical learners were discussed.

To improve some of these indicators, operational plans were developed at the hospital level and their goal setting was one of the priorities of the hospital, which was defined and explained for the members as objectively and clearly as possible. In the meetings, each member was allowed to mention and comment on the areas that needed improvement. Moreover, it was emphasized that the members should listen to the statements and views of the group members with respect and present their complementary opinions after they finish talking. To prevent deviation from the research objectives, the answers were guided if necessary (14). At this stage, the knowledge, views, and attitudes of members about the SCMAR were extracted and after reaching a consensus, the aspects of this system were identified.

Step two

This step mainly aimed to review and approve the axes, sub-axes, and indicators, and its main research method was the expert group meeting. Members of the Medical Education Committee of IRHC were selected as members of the expert group. The members of the Medical Education Committee included the head of the hospital, 19 clinical faculty members, education and treatment deputy of the hospital, head of the hospital quality improvement office, head of the hospital clinics, head of the clinical research unit, head of the hospital education department, and head of the hospital clinical education development office. To further enrich these sessions, three other people were invited, including the deputy of hospital management and resources development, a faculty member familiar with the evaluation methods, and the director of nursing of the hospital. In this step, the nominal group technique (NGT) was used in four stages.

At first, the results of the previous step were presented in the meeting. Afterward, each member of the meeting made the first suggestion that came to their minds, provided that it was not repetitive. New ideas were proposed based on the opinions of each person. The group leader, who was the head of the hospital clinical education development office, was the secretary of the meeting and recorded the responses on a board that was visible to all participants. At the first stage, none of the experts were allowed to comment on the presented ideas. The decision-making process took place using the NGT in four stages, including silent generation of ideas in writing, round-robin recording of ideas, discussion of the list of ideas, and voting (15).

Step three

In the third step, the results of the experts meeting and focus group discussion in the research management team were reviewed to produce a framework for the SCMAR. The research management team consisted of the education and treatment deputy, head of the hospital clinical education development office, three experts in the field of educational methods from the Faculty of Medicine, one expert in the field of information management systems design, and one expert in the improvement of the

quality of medical care. In this step, the results of the previous sessions were combined, relationships among the axes were defined, and no new data was added to the previous data.

Step four

The fourth step was performed to measure the agreement on the sub-axes and indicators of the framework of the SCMAR. Expert members for the consultation included members of the Medical Education Committee, the research management team, and members of the focus group discussion. In this step, the framework of the SCMAR which was obtained from the previous step was confirmed by consensus. For this purpose, the indicators of each aspect of the evaluation axes were designed in the form of a table and sent to all the members. Each of the indicators that were agreed upon by 75% of the participants was finally approved. Moreover, items that were agreed upon by 50–75% of the participants were modified and sent to the members once again. This process continued until every indicator was agreed upon by more than 75% or less than 50% of the participants.

Regarding the validity of the compiled checklist (indicators), the face validity of the evaluation was also confirmed by a survey of the experts. Accordingly, the content validity ratios above 0.78 and the content validity indexes above 0.80 were confirmed. Internal consistency of the questionnaires was calculated at 0.88–0.96 by Cronbach's alpha which indicated the good reliability of the checklist. At the final stage, Excel software (2016 version) was used to summarize the descriptive data on the level of agreement.

Results

According to the demographic characteristics of the participants, about 79% and 74% of them were Physician and male, respectively (Table 1).

Table 1
Demographic characteristics of the participants

Variable		Number (percentage)
Gender	Female	9 (25.7)
	Male	26 (74.3)
Education	Subspecialty and medical fellowship	10 (28.6)
	Medical specialty	13 (37.1)
	Ph.D.	3 (8.6)
	Residency	6 (17.1)
	Master's degree	3 (8.6)
Occupation	Physician (including all medical categories and residencies)	23 (79.4)
	Nurse	3 (10.3)
	Other	3 (10.3)
Work experience	Below 10 years	7 (24.1)
	10–20 years	18 (62.1)
	Over 20 years	4 (13.8)

Based on the steps taken in the present study, the SCMAR was designed and finalized with 10 axes and 35 sub-axes. The axes of the designed evaluation system include objectives, evaluators, areas and indicators of evaluation, evaluation periods, evaluation requirements, data collection, data sources, point assignment and data analysis methods, reporting, and feedback dissemination methods.

According to the designed assessment system, the required data for evaluation is collected from various sources, including the head of the ward, the deputy director of education of the hospital, the faculty members working in the ward, the head nurse, and the patients in the ward. The evaluation period is six months and is based on the rotation of the learners. Moreover, the data collection method is a combination of interview, observation, and document review methods (Fig. 1).

One of the most important axes of the designed SCMAR is the axis of areas and indicators of evaluation. Based on the steps taken in this study, the evaluation indicators were defined in five areas, including individual performance, patient, equipment, hospital policies, and education with 4, 3, 1, 2, 1 indicators, respectively (Table 2). The checklist items had two options (i.e., yes and no) and were scored zero and one. Accordingly, lack of the desirable performance in each indicator and in less than 60% of the evaluated items was scored zero, while the desirable performance in each indicator and in more than 60% of the evaluated items was scored one. The mechanism of data analysis was determined as descriptive

statistics in the form of frequency tables, graphs, and the defined percentage for each of the educational groups and medical wards.

Table 2
Evaluated indicators of medical students

Column	Indicators	Areas
1	Adherence to the dress code	Individual performance
2	Respectful and proper interaction with employees	
3	Punctuality regarding the visit and consultation of the patients	
4	Maintenance of hand hygiene	
5	Respectful behavior towards the patients and adherence to the patient privacy and confidentiality	Patient
6	Provision of understandable training for the patient	
7	Introduction to the patient and stamen of their position in the treatment team before any action	
8	Technical skills in the use of capital equipment and adherence to the principles of maintenance of capital equipment	Equipment
9	Adherence to the requirements of the insurance and medical system	Hospital policies
10	Visiting critical and emergency patients without involving the routine training processes	
11	Education of younger students	Educational

Discussion

This study aimed to design a SCMAR to improve the performance of medical residents in various aspects. The benefits of using an evaluation system include the establishment of a regular evaluation system based on transparent axis and indicators, provision of a comprehensive and practical picture of the performance of residents at the hospital, continuous observation and attention to various aspects of performance in areas related to the patients, individual performance, hospital policies, education, facilities and equipment, recruitment and training of at least 100 evaluators at different levels and categories, increase in the number of evaluations and prevalence of assessment by different evaluators, participation of all stakeholders of medical residents in their evaluation, and an increase in the satisfaction of the stakeholders.

According to previous reviews of comprehensive performance evaluation programs, they have been most influential in the axis of observation and evaluation (7, 16). The influence of the observation axis indicates the importance of a comprehensive and constructive evaluation system (16). In the present study, the aspects and components of the continuous evaluation system were reviewed using the ideas

of experts in four basic steps to guarantee a complete evaluation. Based on the results of a study conducted in Iran using the Objective Structured Clinical Examination (OSCE) method, the feedbacks were positive and the students were content with this evaluation method (17).

In previous studies, students had stated that the OSCE test covered a wide range of clinical knowledge and competencies, identified learning weaknesses, and was equitable. One of the obtained categories was preparation as a process of adaptation; accordingly, by preparing and studying to succeed in various assessments, the students' learning improved regardless of the stress (18). However, the above-mentioned evaluation system had some weaknesses; for instance, regarding the simulation of the clinical environment, it was stressful and was also held in inappropriate locations and at inappropriate times (17, 19).

These results are consistent with the evaluation system designed in the present study in terms of direct observation; nevertheless, the evaluations in this study will be performed in a clinical environment. In the comprehensive OSCE test, the learner might have a good basic knowledge and also know how to use it in different situations, but not be able to perform well when faced with patients (18).

Among the main axes identified in this study were feedback dissemination methods. Continuous assessment in all shifts is conducted by the provision of feedback on the performance of medical residents to improve their performance. In a study conducted on medical students in the Neurology Department, Zhao et al. found that a combination of Mini Clinical Evaluation Exercise (Mini-Cex) and Direct Observation of Procedural Skills (DOPS) can improve the daily evaluation of clinical skills of medical students and help them achieve their educational goals (20).

Similarly, in a study performed in India, Jani et al. found that implementation of a 360-degree evaluation through regular directional programs and provision of feedback to medical residents about their strengths and weaknesses leads to improved performance (21). The best element in learning is the active participation of students in the educational process and the most important point in evaluation is the provision of feedback to them (22). However, despite the important role of feedback in medical education, the status of feedback provision in clinical education is not desirable. Clinical professors either do not provide feedback or provide it in an inappropriate, erroneous, and unplanned form without a specific model or solution (23).

This study aimed to create a framework and consider the characteristics of effective feedback to benefit from the mechanisms of dissemination of feedback, including emails, letters, group meetings, morning rounds, and publication on the hospital website through a summary of the evaluation results based on the individual, group, and educational level. It seems that the continuous assessment of residents promotes professionalism, teamwork, and communication (24). Moreover, the provision of feedback to students can be effective in teaching medical ethics (25). Research has shown that medical students frequently encounter moral conflicts during the course of their study and that the greatest weakness in their communication with patients is introducing themselves (29 – 26).

In this study, evaluation of respectful behavior towards patients and respect for their privacy and the principle of confidentiality, appropriate interaction with the staff, and introduction of themselves to the patient were among the indicators evaluated in the continuous assessment system of learners. This assessment system promotes professional ethics which plays an important role in communication with patients.

Limitations

Due to the outbreak of the COVID-19 pandemic during the final sessions of the assessment system design, it was not possible to have face-to-face interaction and in-depth interviews with residents to benefit from their statements and comments. Therefore, discussions with residents as stakeholders involved in the evaluation process were conducted virtually via e-mail and video call.

Implementation of a SCMAR in the form of a system or application that can be used on smartphones and tablets will greatly increase its effectiveness and establishment. This system should be web-based, provide the ability to define access levels, define users and create a user panel, be user-friendly, provide advice and guidance for users, perform evaluations and provide online performance feedback instantly, provide cross-sectional and process reports, provide reports for individuals, groups, and educational categories, have an archive of evaluation records, be easily updated, send reports in the form of e-mail and text message to managers, allow the managers to view activity reports based on the period, section, and sub-axis in the relevant folder, allow incentives or disciplinary control measurements by choosing the name of the person, their position, and the type of action in question, provide warnings and reminders, and allow the graphic presentation of the information (30). It is suggested that an intervention study be carried out by implementing the SCMAR to generalize the obtained results with more confidence.

Conclusion

Evaluation in the form of a continuous assessment system of learners can help the managers, faculty members, and residents of medical departments to make sure that the tasks are performed more accurately and quickly with fewer costs. It also plays an important role in the promotion and institutionalization of professional ethics and the establishment of effective communication with the patients. It should also be noted that the above-mentioned evaluation system should be performed continuously and provide the necessary feedback to the evaluated groups and individuals. This will increase the possibility of correcting professional behaviors and activities in the evaluated individuals and also increase the effectiveness of education. This has been one of the most important goals of designing a system for continuous assessment of learners in this study.

Abbreviations

SCMAR

system of continuous assessment of medical residents

Declarations

Acknowledgments

The authors would like to thank the faculty members of the clinical departments, the Dean of Mashhad Medical School and the members of the Medical Education Committee who assisted them in the conduction of this study.

Funding

The funding Organizations is Mashhad University of Medical Sciences.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

All of the authors participated in designing the study. M.Y, Z.E and L.M: Conceptualization, Methodology. S.F. and M.T and A.A: Data curation, Writing- Original draft preparation. M.Y and A.KH: Visualization, Investigation. M.Y and L.M: Supervision. A.KH and A.A and M.T: Validation. M.Y and Z.E and L.M: Writing- Reviewing and Editing. The author (s) approved the final manuscript.

Ethics approval and consent to participate

Ethical approval for the study was provided by the Ethics Committee of Mashhad University of Medical Sciences (approval number: IR.MUMS.MEDICAL.REC.1399.716); (project number: 990962) and written informed consent obtained from all the participants. All methods were carried out in accordance with relevant guidelines and regulation.

Consent for publication

Not applicable.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Author details

¹Associate Professor in Health Economics, Department of Health Economics and Management Science, Faculty of Health, Mashhad University of Medical Sciences, Iran. ²PhD candidate in Human Resource Management, Department of Management, Islamic Azad University of North Tehran Branch, Iran.

³Associate Professor in Chinese medicine, Department of Complementary and Chinese Medicine, Faculty of Medicine, Mashhad University of Medical Sciences, Iran. ⁴Assistant Professor in Health information management Department of Medical Records and Health Information Technology, **Faculty of Paramedical**, Mashhad University of Medical Sciences, Iran. ⁵MSC in geriatric nursing, Quality Improvement Office, Imam Reza Educational, Research and Medical Institution, Mashhad University of Medical Sciences, Iran. ⁶Associate Professor in Cardiovascular, Cardiac Electrophysiology Fellowship, Department of Cardiovascular Medicine, Faculty of Medicine, Mashhad University of Medical Sciences, Iran. ⁷Assistant Professor in Anesthesia, Department of Anesthesiology, Faculty of Medicine, Mashhad University of Medical Sciences, Iran.

References

1. Aronson L, Niehaus B, Hill-Sakurai L, Lai C, O'Sullivan PS. A comparison of two methods of teaching reflective ability in Year 3 medical students. *Medical education*. 2012;46(8):807-14. <https://doi.org/10.1111/j.1365-2923.2012.04299.x>
2. Soleymanha M, Jalali M, Mirblouk A, Etehad H, Ahaki H, HaghparastGhadimLimodehi Z, et al. Survey of Clinical Competency in Fourth-year Medical Students of Guilan University of Medical Sciences in 2011: A Short Report. *Journal of Rafsanjan University of Medical Sciences*. 2015;13(8):731-6. [URL: http://journal.rums.ac.ir/article-1-1917-en.html](http://journal.rums.ac.ir/article-1-1917-en.html)
3. Yaghini O, Parnia A, Monajemi A, Daryazadeh S. Designing a Tool to Assess Medical Students' Clinical Competency in Pediatrics. *Research in Medical Education*. 2018;10(1):39-47. [URL: http://rme.gums.ac.ir/article-1-432-en.html](http://rme.gums.ac.ir/article-1-432-en.html)
4. Khalil S, Aggarwal A, Mishra D. Implementation of a Mini-Clinical Evaluation Exercise (Mini-CEX) program to assess the clinical competence of postgraduate trainees in Pediatrics. *Indian pediatrics*. 2017;54(4):284-7. <https://doi.org/10.1007/s13312-017-1089-z>.
5. Jafri L, Siddiqui I, Khan AH, Tariq M, Effendi MUN, Naseem A, et al. Fostering teaching-learning through workplace based assessment in postgraduate chemical pathology residency program using virtual learning environment. *BMC medical education*. 2020;20(1):1-12. [DOI: 10.1186/s12909-020-02299-8](https://doi.org/10.1186/s12909-020-02299-8)
6. Chong DYK, Tam B, Yau SY, Wong AYL. Learning to prescribe and instruct exercise in physiotherapy education through authentic continuous assessment and rubrics. *BMC medical education*. 2020;20(1):1-11. <https://doi.org/10.1186/s12909-020-02163-9>
7. Choi S, Oh S, Lee DH, Yoon H-S. Effects of reflection and immediate feedback to improve clinical reasoning of medical students in the assessment of dermatologic conditions: a randomised

- controlled trial. BMC medical education. 2020;20:1-9. [DOI: 10.1186/s12909-020-02063-y](https://doi.org/10.1186/s12909-020-02063-y)
8. Ogunyemi D, Gonzalez G, Fong A, Alexander C, Finke D, Donnon T, et al. From the eye of the nurses: 360-degree evaluation of residents. Journal of Continuing Education in the Health Professions. 2009;29(2):105-10. <https://doi.org/10.1002/chp.20019>
 9. Goldstein R, Zuckerman B. A perspective on 360-degree evaluations. The Journal of pediatrics. 2010;156(1):1-2. e.[DOI: https://doi.org/10.1016/j.jpeds.2009.09.027](https://doi.org/10.1016/j.jpeds.2009.09.027).
 10. Stark R, Korenstein D, Karani R. Impact of a 360-degree professionalism assessment on faculty comfort and skills in feedback delivery. Journal of General Internal Medicine. 2008;23(7):969-72. [DOI: 10.1007/s11606-008-0586-0](https://doi.org/10.1007/s11606-008-0586-0)
 11. Wood J, Collins J, Burnside ES, Albanese MA, Propeck PA, Kelcz F, et al. Patient, faculty, and self-assessment of radiology resident performance:: A 360-degree method of measuring professionalism and interpersonal/communication skills1. Academic radiology. 2004;11(8):931-9. <https://doi.org/10.1016/j.acra.2004.04.016>
 12. Hayward MF, Curran V, Curtis B, Schulz H, Murphy S. Reliability of the Interprofessional Collaborator Assessment Rubric (ICAR) in Multi Source Feedback (MSF) with post-graduate medical residents. BMC medical education. 2014;14(1):1-9. [DOI: 10.1186/s12909-014-0279-9](https://doi.org/10.1186/s12909-014-0279-9)
 13. Tayyebi S, Hosseini SH, Noori S, Hosseini SM, Derakhshanfar H. Evaluation of clinical education in pediatric wards of hospitals affiliated to Shahid Beheshti University of Medical Sciences according to the Ministry of Health Standards in 2015. J Mil Med. 2017;19(1):63-71. [URL: http://militarymedj.ir/article-1-1589-fa.html](http://militarymedj.ir/article-1-1589-fa.html)
 14. Gerjevic KA, Rosenbaum ME, Suneja M. Resident perceptions of the impact of duty hour restrictions on resident-attending interactions: an exploratory study. BMC medical education. 2017;17(1):1-8. [DOI: 10.1186/s12909-017-0963-7](https://doi.org/10.1186/s12909-017-0963-7)
 15. Shahraki A, Moradi M. Risk evaluation in the workplace using JSA, NGT and Fuzzy TOPSIS. Iran Occupational Health. 2013;10(4). [URL: http://ioh.iums.ac.ir/article-1-532-fa.html](http://ioh.iums.ac.ir/article-1-532-fa.html)
 16. Laidlaw A, Salisbury H, Doherty EM, Wiskin C. National survey of clinical communication assessment in medical education in the United Kingdom (UK). BMC medical education. 2014;14(1):1-7. [DOI: 10.1186/1472-6920-14-10](https://doi.org/10.1186/1472-6920-14-10)
 17. Rafati F, Pilevarzade M, Kiani A. Designing, implementation and evaluation of osce to assess nursing students clinical competence in jiroft faculty of nursing and midwifery. Nursing and Midwifery Journal. 2020;18(2):118-28. [URL: http://unmf.umsu.ac.ir/article-1-3773-en.html](http://unmf.umsu.ac.ir/article-1-3773-en.html)
 18. ADIB HM, Yazdani M. Effects of OSCE on learning, satisfaction and test anxiety of nursing students: a review study. 2018. [URL: http://ijme.mui.ac.ir/article-1-4539-en.html](http://ijme.mui.ac.ir/article-1-4539-en.html)

19. Fidment S. The objective structured clinical exam (OSCE): A qualitative study exploring the healthcare student's experience. *Student engagement and experience journal*. 2012;1(1):1-18.
<https://doi.org/10.7190/seej.v1i1.37>
20. Zhao X, Pan X, Guo N, Xue W, Liu J. The Effect and Analysis of Multiple Assessment Methods in the Assessment of Clinical Ability of Medical Students. *World Scientific Research Journal*. 2020;6(10):387-91. DOI:10.6911/WSRJ.202010_6(10).0047
21. Jani H, Narmawala W, Ganjawale J. Evaluation of competencies related to personal attributes of resident doctors by 360 degree. *Journal of clinical and diagnostic research: JCDR*. 2017;11(6):JC09.
[DOI: 10.7860/JCDR/2017/25907.10027](https://doi.org/10.7860/JCDR/2017/25907.10027)
22. Rao SP, DiCarlo SE. Active learning of respiratory physiology improves performance on respiratory physiology examinations. *Advances in physiology education*. 2001;25(2):55-61.
<https://doi.org/10.1152/advances.2001.25.2.55>
23. Aaltonen K. Stakeholder management in international projects. 2010. <http://urn.fi/URN:ISBN:978-952-60-3344-0>
24. Tahernezhad K, Javidan F. Advanced Assessment of Medical Students Clinical Performance: Challenges Methods and Approaches. *Strides in development of medical education*. 2008;5(1):58-70.
[Available: https://www.sid.ir/fa/journal/ViewPaper.aspx?id=82608](https://www.sid.ir/fa/journal/ViewPaper.aspx?id=82608).
25. Liu Y, Erath A, Salwi S, Sherry A, Mitchell MB. Alignment of Ethics Curricula in Medical Education: A Student Perspective. *Teaching and learning in medicine*. 2020;32(3):345-51.
<https://doi.org/10.1080/10401334.2020.1717959>
26. Noohi E, Mortazavi H. Interns' Communication with Patients during Interview: the Perspectives of Patient and Observer. *Iranian Journal of Medical Education*. 2006;6(2):79-86.
[URL: http://ijme.mui.ac.ir/article-1-218-en.html](http://ijme.mui.ac.ir/article-1-218-en.html)
27. Rahman A. Initial assessment of communication skills of intern doctors in history-taking. *Medical teacher*. 2000;22(2):184-8. <https://doi.org/10.1080/01421590078634>
28. Sullivan BT, DeFoor MT, Hwang B, Flowers WJ, Strong W. A novel peer-directed curriculum to enhance medical ethics training for medical students: a single-institution experience. *Journal of medical education and curricular development*. 2020;7:2382120519899148.
<https://doi.org/10.1177/2382120519899148>
29. AlMahmoud T, Hashim MJ, Elzubeir MA, Branicki F. Ethics teaching in a medical education environment: preferences for diversity of learning and assessment methods. *Medical education online*. 2017;22(1):1328257. <https://doi.org/10.1080/10872981.2017.1328257>
30. Shamsabadi AR, Delbari A, Safari A, Bahador F, Mehraeen E. Capabilities and Requirements of the Elderly Remote Health Monitoring. *Iranian Journal of Ageing*. 2020;15(3):286-97.
[URL: http://salmandj.uswr.ac.ir/article-1-1923-en.html](http://salmandj.uswr.ac.ir/article-1-1923-en.html)

Figures

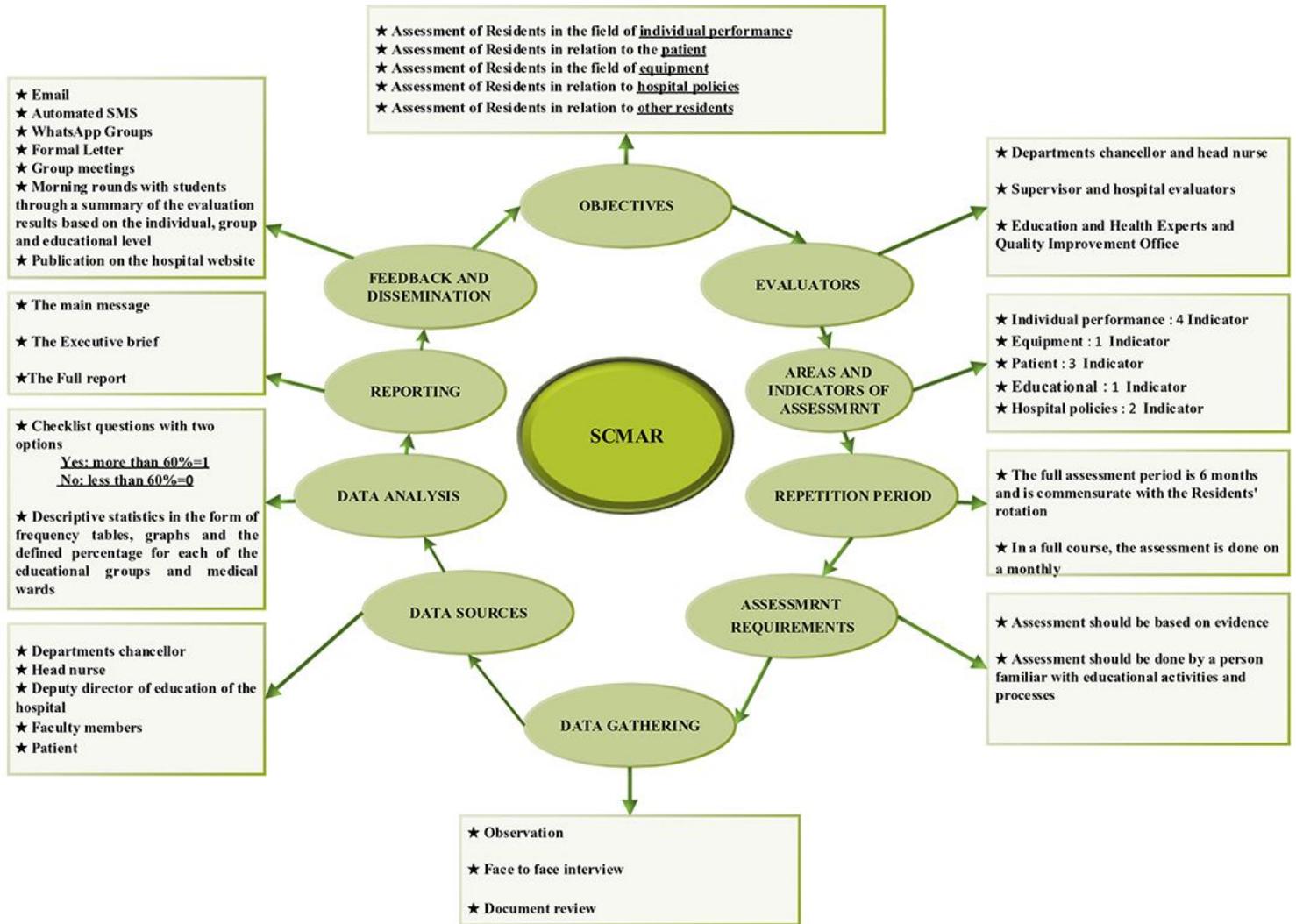


Figure 1

Continuous multidimensional assessment system for medical residents