TELEMEDICINECLINIC
RADIOLOGY QUALITY AWARD

Submission deadline 31st December 2014

SUBMISSION TEMPLATE

Maximum length: 1,500 words + appendix

I. NAME, WORKPLACE, EMAIL AND PHONE

Dr. Orpheus Kolokythas, orpheus.kolokythas@ksw.ch, ++41 52 266 3769

Dr. Matus Straka, matus.straka@ksw.ch, ++41 52 266 2615

Dr. Rene Patzwahl, rene.patzwahl@ksw.ch, ++41 52 266 3940

Prof. Dr. Christoph Binkert, Christoph.binkert@ksw.ch, ++41 52 266 2602

Institute for Radiology and Nuclear Medicine, Cantonal Hospital Winterthur, Brauerstr. 15, Box 834, 8401 Winterthur, Switzerland

II. TITLE

SOCRATES – An electronic standardized evaluation system to promote clinical competency and professionalism of radiology trainees

III. ABSTRACT

Competency and professional development of trainees benefits from regular self-reflection and assessment by peers. While often promoted and recommended by national educational authorities, the implementation of a robust evaluation process in clinical routine might be challenged by many factors.

This proposal introduces a standardized, structured, yet configurable evaluation system for the assessment and promotion of competency and professionalism of radiology trainees. The system includes a self-assessment module, which allows the direct comparison of personal and peer review. Longitudinal evaluations over time as well as horizontal comparison across the institution and modalities allow benchmarking of performance and professional development. Restricted access to the evaluation platform warrants adjustable degrees of confidentiality according to the institutional requirements.

One year after the implementation of quarterly evaluations in a teaching hospital department hosting 11 radiology residents, followed by confidential personal discussion of results, a survey of the eight assessed radiology residents revealed noticeable improvement of satisfaction with the institutional feedback system compared to national average.

IV. BACKGROUND

Developing thorough competency in both specialty and professionalism is of pivotal importance for radiology trainees. Residents and fellows are challenged by uncertainty and limited inexperience early in their career, by volume overload at daily routine and by hierarchical structures within departments. At the same trainees are expected to develop clinical competency and adequate level of professionalism that allows them to interact with colleagues, staff and patients respectfully and effectively. While teaching and learning form the essence of education, a formalized evaluation by peers and self-assessment has not been standardized in many European educational radiological institutions.

Objective feedback and assessment during education and support of this development process might be hampered by absence of precise directives, uncertainty about how to apply assessment criteria and by lack of objectivism and professionalism of peers. While feedback is defined as the immediate informal response to an action or behaviour, evaluation represents a formalized way of assessment. A structured evaluation process for radiology trainees might be supported and recommended by national educational authorities, the implementation of a standardized system with defined criteria applicable specifically to an adequate assessment of radiology trainees however may vary greatly between institutions, if at all implemented. Objective tracking of personal development might be jeopardized by lack of motivation of peers, communication problems and lack of efficient standardized evaluation processes.

Evaluations may thus result in non-objective, irregular and non-representative assessments that do not aid in the advancement of radiology trainees. At the end personal professional education may become deficient with detrimental effects on patient care, personal development and representation of our profession.

V. SPECIFICATION OF PROBLEM SOLVED

Training for radiology residents at our institution, hosting 11 radiology residents, has been a well-structured program with precisely defined rotations by modalities, daily teaching sessions and formalized lectures, yielding it consistently at or slightly above average according to the Swiss Institute for Medical Education (SIWF). As the supervising authority the SIWF conducts annual surveys on the quality of the teaching institutions by sending out standardized questionnaires to all residents. The forms are being filled out voluntarily. Individual answers of participating residents are not published; the results for each institution however are posted publically and can be retrieved from the website www.siwf.ch in German or French language.

While our department consistently scored above national average for the years 2011, 2012, and 2013 on a six-point scale in the categories “overall assessment” and ”implementation of evidence based medicine”, in other disciplines such as “teaching culture”, “learning culture and feedback”, “leadership”, “error and safety”, “decision making” and “communication” our program reached average or only barely above average marks. Further internal observations revealed a lack of regular peer-to-trainee feedback. No regular and standardized evaluation system was in place that would be based on direct input by more than one supervising physician; a formalized self-assessment tool was not available. In addition no formal support or guidance of professional behaviour and development existed.

VI. DESCRIPTION OF SOLUTION

A configurable intranet-based evaluation system was developed that allows peers and trainees to rate performance and professional behaviour using a standardized scoring system. We named the system SOCRATES according to the ancient Greek Athenian philosopher (469 B.C. – 399 B.C.) whose method of dialectic inquiry and logical concluding for the purpose of problem solving is considered fundamental for the approach of philosophical and scientific thinking in European and other cultures. „SOCRATES“ stands for „Standardized Online Competency Review and Advancement of Trainee Evaluation System“, which also describes the approach and purpose of the tool:

The system includes seven categories for assessment: knowledge, patient care, report creation, technical skills, professionalism, personal effort and on-call performance. These categories contain two to six specific points, each pertinent to the field. Each of them is to be addressed by a ten-point rating scale and in addition with comments of free text that all peers of the department are encouraged to give. Specific justifying comments are not only appreciated, but expected, if exceptionally poor or good marks are given. Marks are given by peers anonymously, while free text comments are identifiable.

A self-assessment module, containing the same categories and criteria, is displayed next to the peers’ assessment for comparison of results, once each side, trainees and peers, has completed the evaluation independently from each other. User access can be adjusted to allow for adequate transparency and confidentiality at the same time. Modality-supervising radiologists have access to results of their modality only, while system administrator, residency program director and institutional director have access to results of all modalities (**figures 1** and **2**).

We chose to use a rotation schedule and review process based on imaging modality. However the evaluation form is the same for all rotations. We determine the rotation schedule for the entire year upfront where residents switch rotations on a quarterly basis. Evaluations are available electronically to be filled out by accessing the institutional intranet during or after each rotation. Additional email reminders are sent out at the end of each quarter and a deadline is set shortly after each quarter by which all entries would have to be completed, in order to allow for a timely analysis of results.

Horizontal tracking of individual results in comparison to all other residents across the year or longer allow a quantitative and qualitative assessment of personal performance.

Longitudinal comparison of individual performance and development over time can be displayed for one modality, when rotations are repeated over time. Plots generated by the system allow quick comprehension of results and are displayed at the bottom of each quarterly report (**figures 3**-**6**).

Quarterly discussions between modality supervisors and residents are conducted individually and confidentially to ensure timely communication of results, to provide support and give directions for further development and improvement of performance. Annual discussions occur between residency program director and the individual resident to integrate results of the year in the overall assessment and plan within the training program and to determine a potential need for adjustment in the rotation schedule or for other modifications.

The evaluations are printed out by the supervisors along with an automatically generated date and time stamp, signed by resident and supervisor and filed to the resident's institutional record. Another signed copy is for the president's personal record.

VII. PROOF OF DEMONSTRATED IMPACT

One year after implementation of SOCRATES in January 2014 there was uniform notion and agreement between residents and peers that the system was reliable and easy to use. No technical failures occurred. A "save for later" function allows for fragmentation of the evaluation process in a busy routine, even though it is usually quick to do, taking between 3 and 15 minutes for each trainee, depending on the length of the individual comments given.

The Swiss national satisfaction survey 2014 revealed a noticeable increase in the rating for "regular feedback" from 5.0 in 2013 to 5.9 points in 2014 on a six-point scale (max. 6.0), compared to 5.1 points national average (**figure 7**), raising our department in the entire category on "learning culture" from 5.1 points in 2013 to 5.6 points in 2014, compared to 5.2 points nationally. No other measures were implemented during the year other than the evaluation system, along with instructions on how to use it.

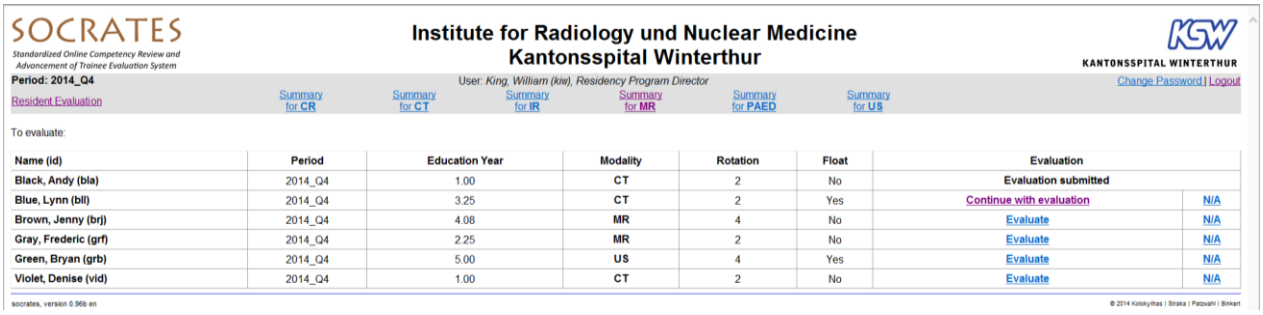
Also other categories such as "Decision Making" and "Error and Safety" were rated higher: Marks for "Error and Safety" increased from 5.2 to 5.6 points, compared to 5.0 and 5.2 points nationally between 2013 and 2014. Even though it is probably not as self-explanatory as "regular feedback" is for the explanation of the improvement of results, the system might have had an influence on how trainees are being pointed out errors and how they reflect on them once errors are documented and analyzed in a standardized system. However SOCRATES is not a documentation system for logging operational errors.

We are also not using the system to rank residents; however we found it to be an efficient and more objective method to assess radiology trainees individually than in the past. The quarterly discussions of the evaluations with the resident allow for timely motivation and, if needed, for adjustment of teaching and learning efforts measures to improve performance.

Appendix

Figure 1: Screenshot of the evaluation system showing cockpit view for the residency program director: hyperlinks in the gray bar allow viewing of results of evaluations of all modalities and are accessible to the program director, department chair and system administrator only.

Further below appears the table with the list of residents that are to be evaluated for a specific period by the program director, who is involved in the rotations CT, MR and ultrasound in this example. All peers have access to their own password protected user accounts that display similar tables with residents who were supervised by them. Names and content of this screenshot are modified for confidentiality.



SOCRATES
Standardized Online Competency Review and Advancement of Trainee Evaluation System

Institute for Radiology und Nuclear Medicine
Kantonsspital Winterthur

KANTONSSPITAL WINTERTHUR

Period: 2014_Q4
User: *King, William (kiw), Residency Program Director*
Change Password | Logout

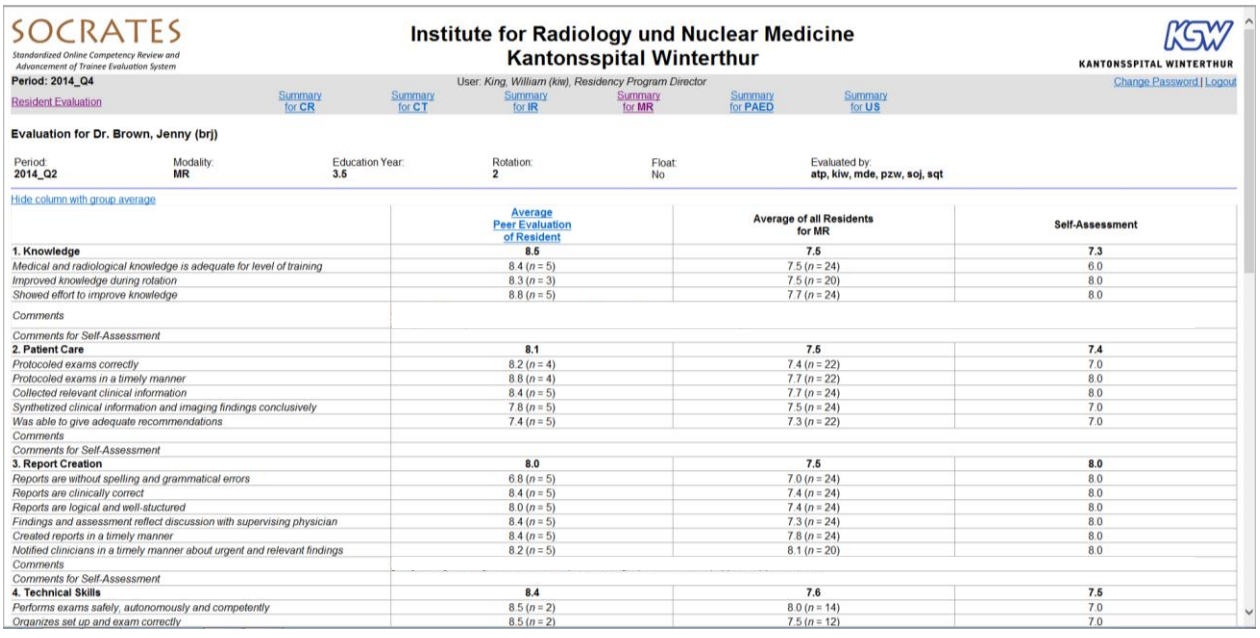
Resident Evaluation | Summary for CR | Summary for CT | Summary for IR | Summary for MR | Summary for PAED | Summary for US

To evaluate:

Name (id)	Period	Education Year	Modality	Rotation	Float	Evaluation	
Black, Andy (bla)	2014_Q4	1.00	**CT**	2	No	**Evaluation submitted**	
Blue, Lynn (bll)	2014_Q4	3.25	**CT**	2	Yes	Continue with evaluation	N/A
Brown, Jenny (brj)	2014_Q4	4.08	**MR**	4	No	Evaluate	N/A
Gray, Frederic (grf)	2014_Q4	2.25	**MR**	2	No	Evaluate	N/A
Green, Bryan (grb)	2014_Q4	5.00	**US**	4	Yes	Evaluate	N/A
Violet, Denise (vid)	2014_Q4	1.00	**CT**	2	No	Evaluate	N/A

socrates, version 0.96b en
© 2014 Kolokythas | Straka | Patzwahl | Binkert

Figure 2: Screenshot of summary for MR evaluations for a 3rd year resident on her second MR rotation. Names and results are modified for confidentiality. Average peer evaluation, which can be broken down in individual peer evaluations, group evaluation and self-assessment, are displayed next to each other for comparison. Plots of results are displayed below the table and are part of the evaluation record (not shown in this screenshot, see figures 3-6)



SOCRATES
Standardized Online Competency Review and Advancement of Trainee Evaluation System

Institute for Radiology und Nuclear Medicine
Kantonsspital Winterthur

KANTONSSPITAL WINTERTHUR

Period: 2014_Q4
User: *King, William (kiw), Residency Program Director*
Change Password | Logout

Resident Evaluation | Summary for CR | Summary for CT | Summary for IR | Summary for MR | Summary for PAED | Summary for US

Evaluation for Dr. Brown, Jenny (brj)

Period: **2014_Q2** | Modality: **MR** | Education Year: **3.5** | Rotation: **2** | Float: **No** | Evaluated by: **atp, kiw, mde, pzw, soj, sqt**

Hide column with group average

	Average Peer Evaluation of Resident	Average of all Residents for MR	Self-Assessment
1. Knowledge	**8.5**	**7.6**	**7.3**
Medical and radiological knowledge is adequate for level of training	8.4 (*n* = 5)	7.5 (*n* = 24)	6.0
Improved knowledge during rotation	8.3 (*n* = 3)	7.5 (*n* = 20)	8.0
Showed effort to improve knowledge	8.8 (*n* = 5)	7.7 (*n* = 24)	8.0
Comments			
Comments for Self-Assessment			
2. Patient Care	**8.1**	**7.5**	**7.4**
Protocoled exams correctly	8.2 (*n* = 4)	7.4 (*n* = 22)	7.0
Protocoled exams in a timely manner	8.8 (*n* = 4)	7.7 (*n* = 22)	8.0
Collected relevant clinical information	8.4 (*n* = 5)	7.7 (*n* = 24)	8.0
Synthetized clinical information and imaging findings conclusively	7.8 (*n* = 5)	7.5 (*n* = 24)	7.0
Was able to give adequate recommendations	7.4 (*n* = 5)	7.3 (*n* = 22)	7.0
Comments			
Comments for Self-Assessment			
3. Report Creation	**8.0**	**7.5**	**8.0**
Reports are without spelling and grammatical errors	6.8 (*n* = 5)	7.0 (*n* = 24)	8.0
Reports are clinically correct	8.4 (*n* = 5)	7.4 (*n* = 24)	8.0
Reports are logical and well-stuctured	8.0 (*n* = 5)	7.4 (*n* = 24)	8.0
Findings and assessment reflect discussion with supervising physician	8.4 (*n* = 5)	7.3 (*n* = 24)	8.0
Created reports in a timely manner	8.4 (*n* = 5)	7.8 (*n* = 24)	8.0
Notified clinicians in a timely manner about urgent and relevant findings	8.2 (*n* = 5)	8.1 (*n* = 20)	8.0
Comments			
Comments for Self-Assessment			
4. Technical Skills	**8.4**	**7.6**	**7.5**
Performs exams safely, autonomously and competently	8.5 (*n* = 2)	8.0 (*n* = 14)	7.0
Organizes set up and exam correctly	8.5 (*n* = 2)	7.5 (*n* = 12)	7.0

Figure 3: Spider web plot of a 2nd year resident in his first MR rotation (name and data modified for confidentiality): The results show a weakness in knowledge by at least two marks when compared to the group of fellow residents at the same institution, while the resident is well up to the group average level in all other categories.

On-call performance is evaluated separately from the modality-specific categories on each rotation, but is also listed on a quarterly basis; for reasons of practicality it is discussed with the modality supervisor of the quarter. In this case on-call performance is lagging behind the group average and more inquiries would have to be done to investigate the source of this weakness.

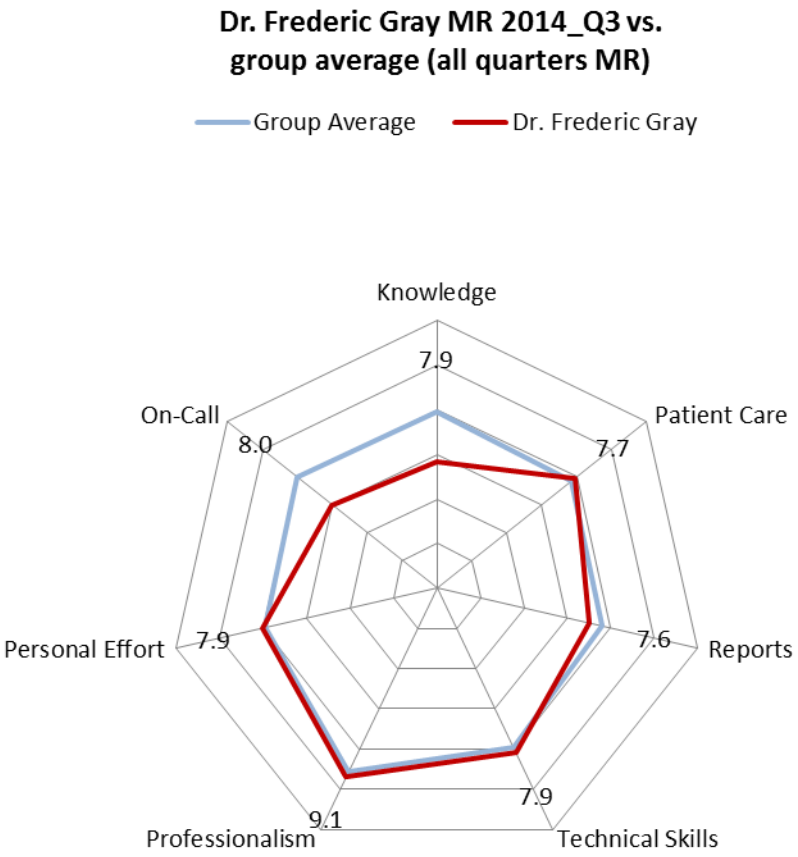


Figure 4: Diagram showing trend of the second MR performance of a 2nd year resident (name and data modified for confidentiality) compared to his previous MR rotation and to the group average (only the group average for MR rotations of the past 4 quarters is being compared): despite a noticeable gain in MR knowledge from 5.1 points after his first MR rotation in Q2/2013 to 5.7 points in Q3/2014, this resident still has to do a lot of catch up work to reach the departmental average of 7.9 for knowledge in MR.

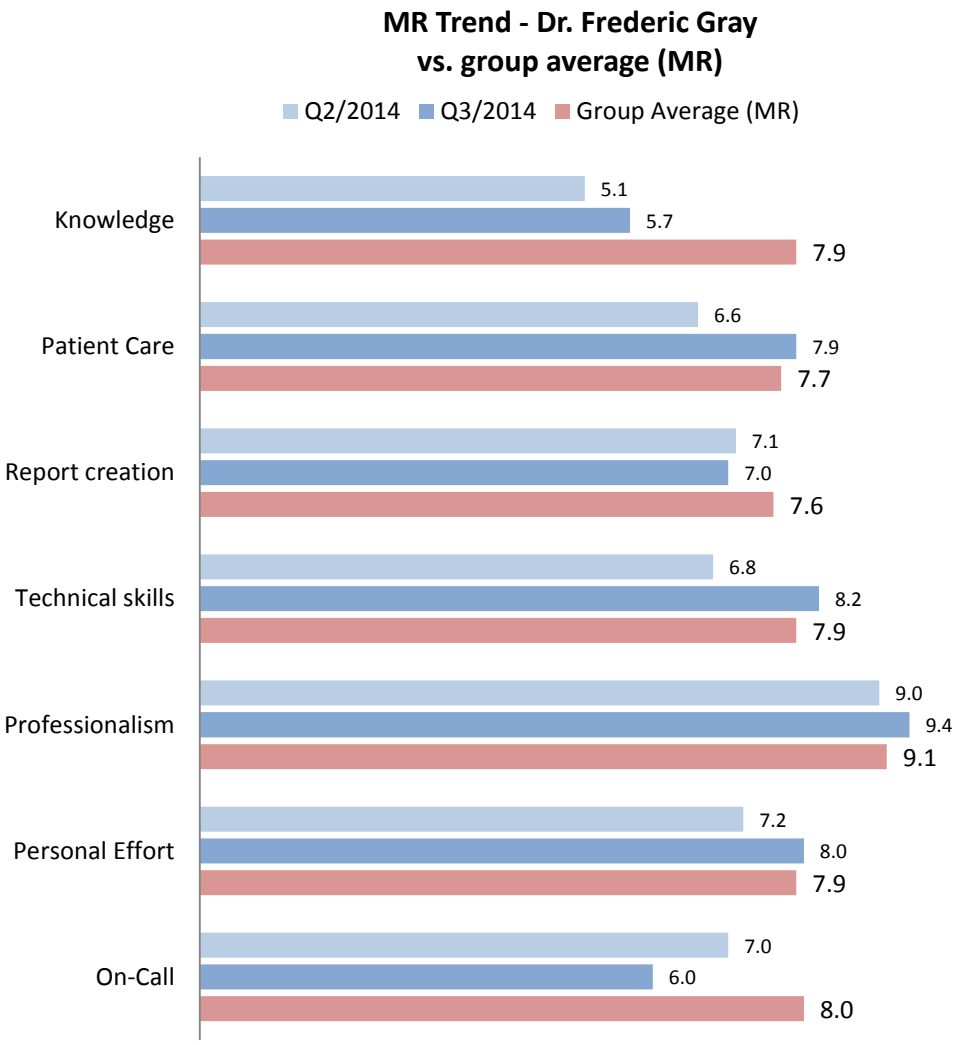


Figure 5: Comparison of a 2nd year resident's second MR rotation with his previous two rotations in CT and ultrasound: Knowledge in MR is weaker even on his second MR rotation than for CT and ultrasound, despite good personal effort. Focussed suggestions for specific reading as well as more basic or step-by-step teaching efforts might be indicated.

Professionalism has been excellent throughout all three rotations and needs no additional initiatives at this time (name and data modified for confidentiality).

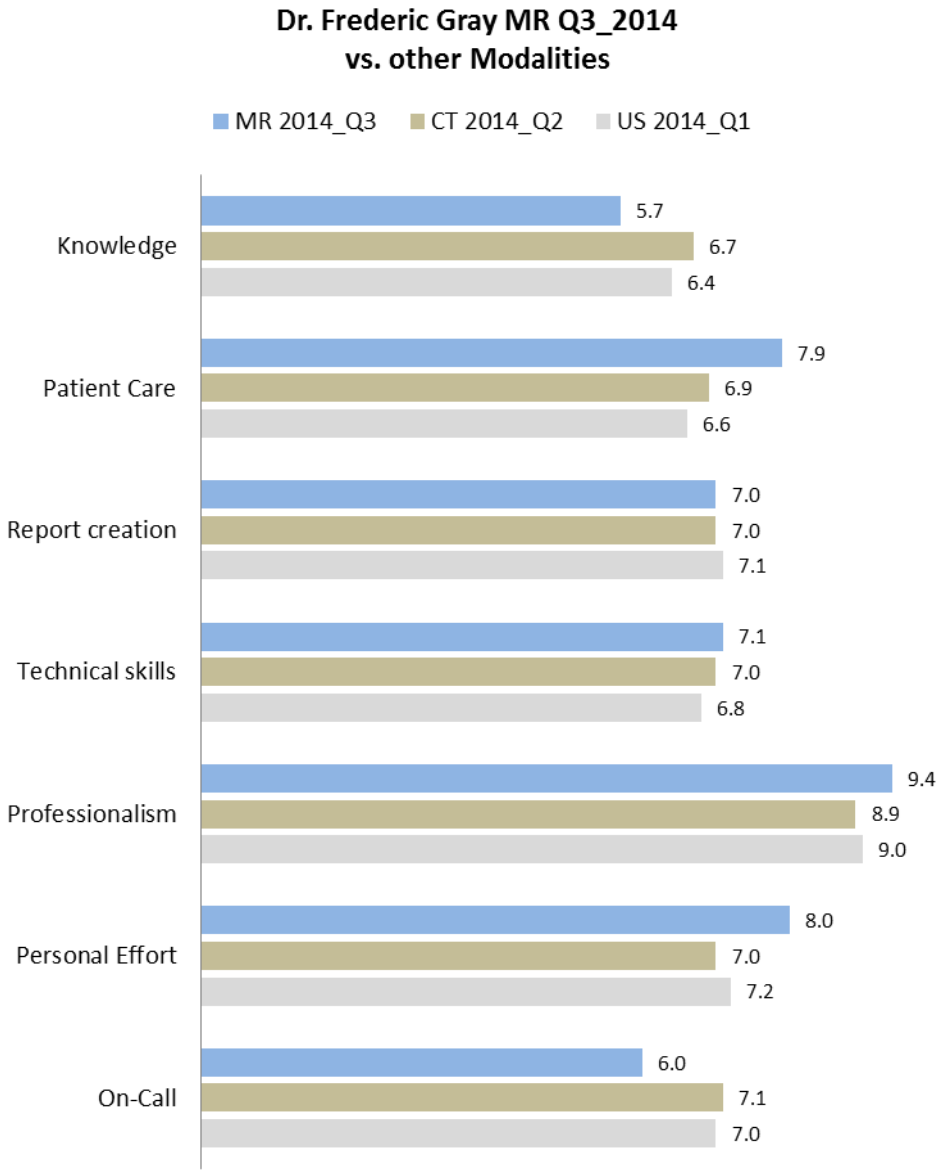


Figure 6: Discrepancy between Self-Assessment and Peer Review (name and data modified for confidentiality). The aim is to detect substantial discrepancies between the two assessments rather than determining absolute values of performance. We consider discrepancies between self-assessment and peer evaluation of not more than 1.5 points negligible on a 10 point scale, like in this example.

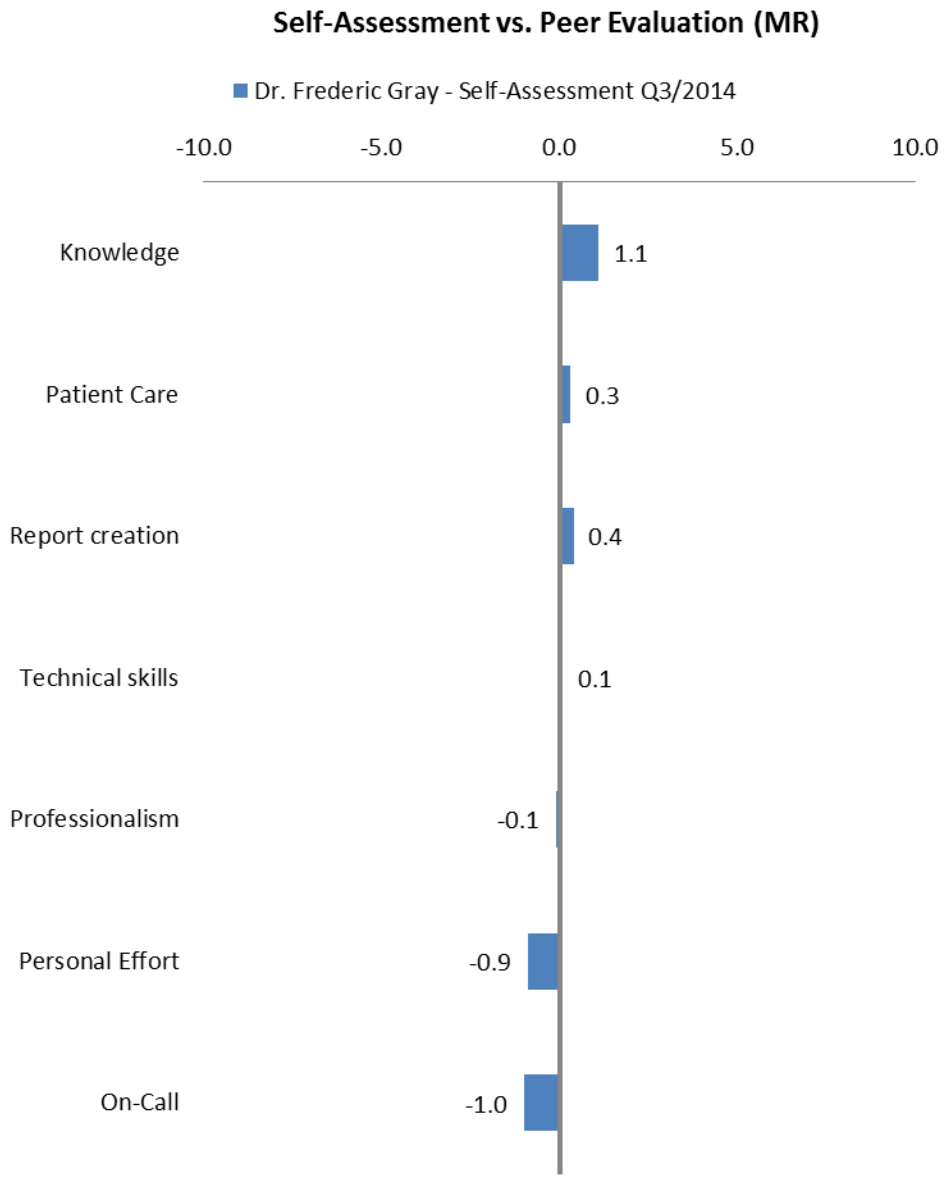


Figure 7: Diagram showing how residents at our institution ranked the frequency of feedback by peers in the national annual surveys over three years of time: after implementation of the evaluation system the ratings increased from 5.1 and 4.9 in previous years to 5.9 in 2014, in contrast to the Swiss national average of 5.1 which remained stable around 5.0±1.