OPEN ACCESS

European Journal of Teaching and Education
ISSN 2669-0667

Implementing the Radiology Rotation-Model-22 in Clerkships: The RRM-Pocket Card for Medical Students – Part 2

Ilona Petsch[1*], and Boris Buerke[2]

[1] Chair Business and Human Resource Education II, University of Paderborn, Paderborn, Germany
[2] Department of Diagnostic and Interventional Radiology and MR-Tomography, Klinikum Guetersloh, Guetersloh, Germany

ARTICLE INFO

Keywords:
clerkships,
medical students,
participant observation,
pocket card,
radiology,
rotations,
RRM,
Radiology Rotation-Model-22,
self-action,
tool,
training

ABSTRACT

Practical training for medical students in radiology clerkships takes place in busy clinical routine. We introduced the Radiology Rotation-Model-22 (RRM) as the department-related RRM-pocket card for student rotation (SR) settings in part one of this study. RRM was developed as a documentation tool and pocket card with department sections for radiology (10) and imaging specialties (1) for medical students in clerkships. With the RRM-tool, and while exploring departments for practical experience, students can log data details on rotations and tasks by the method of participant observation (PO). By PO, students can track SR and training progress. In part two, we present attempts on implementing the RRM-tool as a rotation concept for students to gain efficient training experience. The RRM-pocket card provides students, radiologists, and radiographers with an overview of SR and tasks. RRM can be implemented to optimise clerkships' structure, and to generate self-action for students, while actively optimising SR.

1. Introduction

1.1. Radiology Student Training

As with other medical disciplines, workload in radiology's patient care is rising for radiologists and radiographers at smaller and bigger hospitals in Germany. Practical training for students takes place in clinical routine. With radiology being central and indispensable to patient care, radiologists need students to become familiar with diagnostic and interventional imaging exams to sufficiently prepare for multiple clinical questions in upcoming medical practice (Gunderman et al., 2003; Oancea et al., 2013; Ayas et al., 2023). Radiology departments – its reading rooms with workstations and different workplaces, control and imaging rooms – are settings for student rotations (SR) in training practice. In clerkships students need to move through radiology rooms to be trained as medical doctors. They are expected to explore SR settings, and gain practical experience under supervision. Radiologists and cooperating specialists demand a student-oriented and structured training approach, to encourage responsible and self-active case reading and presenting, and to foster utilising of medical skills

* Corresponding author. E-mail address: ilmapetsch@gmail.com

Cite this article as:
Petsch, I., & Buerke, B. (2024). Implementing the Radiology Rotation-Model-22 in Clerkships: The RRM-Pocket Card for Medical Students – Part 2. *European Journal of Teaching and Education, 6*(2): 1-11. https://doi.org/10.33422/ejte.v6i2.1208

in clinical routine (Naeger et al., 2013; Rahim & Ros, 2016; Kirch & Sadofsky, 2021; Kemp et al., 2022). Students should be involved in patient care to be enabled to actively shape their own training roles (Gunderman & Bedi, 2013).

We have developed the Radiology Rotation-Model-22 (RRM) for both medical students to log and track department rotations' details, and for radiologists to optimise clerkships' quality and structure in demanding clinical routine. Despite of rising workload for medical educators in radiology's already busy patient care, clerkships still need to offer efficient student training. In part one of this study – undertaken in 2022 –, we have introduced the RRM-pocket card's theoretical concept. In part two – likewise conducted in a teaching hospital setting of diagnostic and interventional radiology in Germany in 2022 –, we present five tentative attempts on implementing the RRM-tool by the example of the model's eight out of ten different department sections, i. e. medical students' self-action in clerkships; students exploring SR with radiologists; students moving through radiology rooms; specialty rotations for students in the practical year (PY); and students keeping track of performed practical tasks during SR. Our aim is to touch upon these tentative attempts by delivering first ideas as exemplary beginnings of implementing RRM in radiology's training practice. We attempt to present how RRM can be put into practice as a rotation concept, and how the model can add to students' training experience in radiology.

2. Discussion

2.1. Active Contributing

Other than a pre-filled plan for departmental workstations, the RRM-pocket card can help students to follow individual rotations and training progress, and to generate students' self-action. Students need to be involved in patient care, in order to actively contribute to their own roles in practical training (Gunderman & Bedi, 2013). In terms of participant observation (PO), they have immediate access to workplace settings, giving them the chance to self-observe SR rounds in a well-structured illustration, take notes, and actively affect clerkships' processes and outcomes according to their assumptions and interests (Atteslander, 2010; Zierer et al., 2013; van Ophuysen et al., 2017; Jorgensen, 2020; Döring, 2023). The RRM-pocket card's department sections (10), as introduced in part 1, are: computed tomography (CT), magnetic resonance imaging (MRI), chest radiology (CHX) and musculoskeletal radiology (MSK), ultrasonography (US), mammography (MG), pediatric radiology (PR), trauma radiology (TR), neuroradiology (NR), CT angiography (CTA) and MR angiography (MRA); specialty rotations to or from nuclear medicine (NUC) and radiation therapy (RT) (Appendices A and B).

Since PO as a method and its proceeding are subjective, it is inherent that SR experience is reflected with radiologists and peers, to critically share self-observation, handle feedback, avoid biased assumptions, and to ensure RRM's overall application quality (Lareau, 2021; Liu & Sullivan, 2021; Döring, 2023). Expert knowledge and guidance by teaching radiologists is indispensable in the RRM-concept. Without self-reflecting on rotation details, or discussing these with radiologists, unchecked logging might not be productive. Radiologists' expertise is requisite for every clerkship's quality. If a student is into the second week of SR in the CT department, without having inserted a venous shunt (VS), or joining a CT exam from the control room, self-action is required. By means of RRM it is the student's turn to notice this, join patient communication, request to practice inserting VS under supervision, and to actively find out about the next CT scan or X-ray in line, e. g. for fractures, or for chest fluoroscopy. The student should also check with the TR department for emergency exams, preferably also

assist residents on a nightshift, attend a respective conference, try to present a case on a fracture, and jot this down in the tool's CT and TR department sections (see Appendix B).

Although not primarily responsible for medical education, radiographers are involved in daily training interactions, e. g. supervising while students insert VS. If students report that they benefit from nurses and paramedics in clinical settings, radiographers in diagnostic and interventional radiology belong to the teaching set-up all the same (Liu & Sullivan, 2021). If combining practicing VS and following CT scans with the same patient, this should be anonymised, and logged in the respective SR, e. g. in the CT department section, *I joined* patient communication for CT scan preparation (PT 01), and imaging exam (PT 01), *I did* insert VS (PT 01); or *I joined* MRI scan preparation, and I assisted in marking of breast (PT 02), and *I did* insert VS (PT 02) in the MRI department section; or in the CXR/MSK department section, *I joined* patient communication on iodinated contrast media (ICM) (PT 03), and intervention for drainage (PT 03), and *I did* insert VS (PT 03) (see Appendix B). When joining patient communication, students should get to hear the radiologist address possible allergic reactions to ICM (e. g. see MRI department section, Appendix B).

2.2. Exploring Student Rotations

During the pretest, revision in the teaching hospital setting of diagnostic and interventional radiology allowed us to make precise dividing and clear naming of the three tool sections (first and second section on the front, third section on the back), to reach a suitable and handy tool for PO in SR at hospitals or medical offices for students familiar with clerkships' structure (Atteslander, 2010; Zierer et al., 2013; van Ophuysen et al., 2017; Döring, 2023) (Appendices A and B). However, radiologists and radiographers should briefly become familiar with using the tool, and students should receive instructions at the start of clerkships. Simply being handed the RRM-pocked card – or any pocked card, really –, might result in limited usage of the tool's full potential. If data details are logged differently than supposed to, or if students appear to get demotivated, or lose track of SR, clear instructions are essential to highlight RRM's value (Döring, 2023). Students' brief in-between reflecting with radiologists helps to avoid selective logging, and to emphasise the idea that students themselves can actively optimise their own SR.

As future medical doctors of any specialty, students should know imaging's central place in medical care, the fundamentals for full body and organ imaging, reading cases in emergencies, evaluating disease stages and prognoses, how to be involved in surgical management with interventional procedures, and know when to consult a radiologist for diagnosis, patient treatment and follow-up (Rahim & Ros, 2016; Creagh et al., 2021; Clements et al., 2022; Li & Brown, 2023). Students can explore SR to learn about multiple imaging exams according to indications or contraindications, case reading and reporting, and clinical questions (Petsch et al., 2021). Results of a study highlight, however, that students can already classify imaging information, and are well aware of radiology's integral position in diagnosis, consultation, observation, and medical care, and the cooperation it upholds with surgery and emergency medicine for instance (Leschied et al., 2013; Grimm et al., 2022).

The pocket card's third section is optimal with regards to conferences, as participation in MC can be logged specifically, e. g. MC with general surgery, underlining radiology's daily cooperation in clinical care. As the radiologist is a central part of many MC and MTB, students can explore a large variety of conferences in radiology clerkships, which can be noted down within the rotation concept, e. g. myeloma and lymphoma MC in the tool's CT department section, e. g. prostate cancer and urogenital MTB in the MRI section, e. g. thoracic MTB in the

CXR section, e. g. gynecologic MTB in the US section, e. g. breast MC in the MG section, e. g. gastrointestinal (GI) MTB in the TR department section (see Appendix B).

2.3. Moving Through Radiology Rooms

Medical teaching still shows that there is a call for making interactive and structured concepts available for students to explore imaging case lists, interpret patient cases, write up reports, and actively perform communication as in informing patients overseen by radiologists, e. g. in the US or MRI department (Naeger et al., 2013; Rahim & Ros, 2016; Rohren et al., 2022). Students should become familiar with imaging exams by moving through different radiology rooms, insofar as not to be too challenged, or overloaded with complex information on imaging or its various techniques. When introducing the RRM-tool, students should be encouraged to fill in the department sections, without, however, having to fill in every single blank space. Doing so, this could challenge students' training experience during first clerkships in a counter-productive way, tamper with their self-action, or eventually limit the overall idea of the RRM's concept.

Students should move on to the reading room continually to fully understand comprehensive CT and MRI scans, e. g. by observing the radiologist ruling out malignant transformations of kidney cysts, to learn about the many diagnostic and therapeutic options of invasive exams in the imaging room of the CTA or MRA department, e. g. while assisting during vascular dilatation procedures or minimally invasive procedures in the liver or kidney, such as embolization, joining the vascular MC, or to move to the control room of the NR department, e. g. in observing a thrombectomy with stroke patients (Murphy et al., 2014; Chew et al., 2020). Joining the GI MTB, vascular MC or angiology MC can be jotted down in the pocked card's CTA/MRA department section (see Appendix B). Pre-measuring findings of kidney cysts, liver cysts, or breast cysts (see MRI department section, Appendix B), or findings in the liver, uterus, or spine (see CT department section, Appendix B), as well as presenting cases on breast cysts or malignant findings in the liver from a GI MTB, can be documented accordingly.

The RRM-pocket card should be employed around departments without collecting and processing any information related to staff, students, patients and family members. Involved radiologists, radiographers, and other teaching staff should be informed prior to PO, and students should likewise notify clinicians of any other specialty, or resident physicians at medical offices. RRM's usage and aim, as in observing and logging of any data details, must be announced in advance to all staff involved (Atteslander, 2010; Zierer et al., 2013; van Ophuysen et al., 2017). Once notified, staff usually carry on with regular work, while students themselves are team members in the respective medical setting, and PO procedure becomes a neutral part of workflow in clinical routine (Jorgensen, 2020; Lareau, 2021; Döring, 2023).

2.4. Rotating in the Practical Year

The overview gained by the RRM-tool's additional section for specialty rotations, serves students during the last year of medical studies, i. e. the PY in Germany. Having chosen radiology for PY, this elective training is the last occasion to practically encounter imaging before entering medical practice as residents. Some opportunities the PY brings along are utilising clinical skills, getting acquainted with demanding situations, and learning physicians' views on cases, who in the end will order imaging exams, and refer to radiologists for consultation (Oancea et al., 2013; Schweitzer & Sarkany, 2020; Ayas et al., 2023). However, since the PY is the last stage of medical studies, students might be preoccupied with completing this phase, rather than thoroughly keeping up with logging with the RRM-tool.

If students in radiology choose to attend part of their PY or a short observation in another specialty, performed SR and attended shifts across medical specialties can be tracked, when joining patient communication, and imaging exams in NUC, e. g. on uterus, liver, kidney, or spine, or in RT, e. g. on breast (see *specialty rotation*, Appendices A and B). This could include NUC or RT as further imaging specialties, or cooperating specialties, such as pediatrics, if focused on PR, or gynaecology, if interested in MG. Upon return radiologists can oversee clinical exams observed or practical tasks performed, as logged on individual pocket cards. This requires, that different specialties are open to RRM as a potential rotation concept. We can only assume that students' logging experience with the RRM-pocked card would be welcome in other specialties.

Vice versa, visiting students from cooperating medical specialties can perform SR or short observations in selected departments suiting their initial PY, e. g. when rotating from pediatrics, gynaecology, neurology, or general surgery. Assuming that clinicians are open to RRM, the model can help involved clinicians to oversee which departments, and MC or MTB students generally get to see, and which tasks they get to practice when rotating to radiology. This could contribute to multidisciplinary cooperating in setting up efficient and broad PY rotation periods across specialties, just before entering the last medical exam to become medical doctors. Radiology is an interdisciplinary specialty overlapping with almost every specialty (Gunderman et al., 2003; ESR, 2022). Hence radiology is a central part of MTB. In that sense, RRM is an optimal rotation concept to be employed in future multidisciplinary teaching concepts.

2.5. Keeping Track with the RRM-Pocket Card

With busy work schedules, radiologists, and radiographers expect students to learn their way around during SR. If teaching time is limited due to disruptions, complexity, and challenging encounters in patient care, and with specialists rotating across departments, valuable learning experience in the reading room is limited for students (Naeger et al., 2013; Petsch et al., 2020; Rizvi & Borges, 2020; Clements et al., 2022). This is where the RRM-pocket card can help to keep track of performed tasks, such as performing a pre-ultrasound scan of the kidney before drainage of a kidney abscess, pre-measuring findings in ultrasound scans, e. g. of kidney cysts, ovarian cysts in the US department; or in mammograms in the MG department, e. g. of breast cysts (benign), breast tumors (malignant); or presenting patient cases on benign and malignant findings after attending related MTB (see Appendix B).

Practical tasks, e. g. in assisting a senior consultant radiologist perform a CT-guided liver biopsy by handing the liver biopsy needle, assisting during a lumbar puncture (see CT department section, Appendix B), or in assisting during markings of breasts and punch biopsies (see MG department section, Appendix B), and joining MTB where patient cases are handled for diagnosis or differential diagnosis, and medical treatment, can be noted down. Yet, logging should not be done while assisting during interventions. Workflow should not be interrupted, and patients' privacy should be respected.

Clinical diagnoses for malignant findings are almost always delivered through imaging exams, while radiology and pathology are cooperatively involved in reading patient cases (Chew et al., 2020; Creagh et al., 2021). Hence students profit from assuming training in radiology. Despite of the need to identify serious findings, it has been stated that students implicitly come across imaging with abnormal findings while case reading during clerkships, and while having to differentiate between normal and pathological findings, including manifold variations (Bailey et al., 2014; Kelly & Slanetz, 2015; Rohren et al., 2022). Case reading can be tracked with the pocket card's structure throughout departments.

Radiologists and cooperating specialists request a student-oriented, and structured approach to training in radiology, to encourage responsible and self-active case reading and presenting, and to generate utilising of essential skills in clinical routine (Naeger et al., 2013; Rahim & Ros, 2016; Kirch & Sadofsky, 2021; Kemp et al., 2022). Within the model's rotation concept, students can become more active about structuring their individual SR. The Radiology Rotation-Model-22 is intended to be implemented in radiology clerkships and short observations, to add to students' self-action about the making of their own training practice throughout medical studies.

3. Limitations

There are some limitations. This study refers to radiology departments at medical institutions in Germany. However, the RRM-model can be used for radiology training around the world; necessary modifications can be made. It needs to be addressed that although RRM comprises multiple radiology departments, it does not cover all clerkships' aspects. This study covers an exemplary view of radiology training at medical state institutions in Germany. RRM is a holistic contribution to optimise clerkships' structure for medical students, radiologists, and radiographers. The RRM-pocked card's back side has limited space for extensive note taking, yet, enough space for exemplary notes. It was our intention to design a pocket-size format. We are aware that some of the font size may be difficult to read. For reading convenience the RRM may be distributed in enlarged printout. We do not intend to exclude anybody, if difficulties with reading small font should apply.

4. Conclusions

Practical training for medical students in radiology clerkships takes place in busy clinical routine. Radiologists need medical students to learn about different imaging exams. The Radiology Rotation-Model-22 (Appendices A and B) covering department sections for radiology (10) and imaging specialties (1) for SR, provides medical students in clerkships and short observations with the department-related RRM-pocket card. By PO, students can log details on SR and tasks with the RRM-tool when moving through different radiology rooms. They can track individual department rotations and training progress throughout medical studies. The RRM-pocket card provides students, radiologists, and radiographers with an overview of performed SR and tasks across hospitals and medical offices. Part two of this study shows first attempts on implementing RRM as a rotation concept, and on adding to students' training experience in radiology. The model can be implemented for training practice to optimise clerkships' structure. RRM can generate self-action for medical students, while structuring and actively optimising SR in radiology clerkships.

Disclosure Statement

The authors declare that they have no conflicts of interest. The authors alone are responsible for the content and writing of this article.

Abbreviations

Cerv.: cervical
CHX: chest radiology
CT: computed tomography
CTA: CT angiography
D: day, days

FAM: Famulatur [German for *medical clerkship*]
GI: gastrointestinal
ICM: iodinated contrast media
MC: multidisciplinary conference, multidisciplinary conferences
MG: mammography
MRA: MR angiography
MRI: magnetic resonance imaging
MSK: musculoskeletal radiology
MTB: multidisciplinary tumor board
N/A: not applicable
NR: neuroradiology
NUC: nuclear medicine
PO: participant observation
PR: pediatric radiology
PT: patient
PVC: peripheral venous catheter, peripheral venous catheters
PY: practical year
RRM: Radiology Rotation-Model-22
RT: radiation therapy
SR: student rotation, student rotations
TB: tumor board, tumor boards
TR: trauma radiology
US: ultrasonography
VS: venous shunt, venous shunts
W: week, weeks
X-ray: Roentgen rays

References

Atteslander, P. (2010). Methoden der empirischen Sozialforschung [Methods of empirical social research] (13th ed.). Berlin, Germany: Schmidt Verlag. 73, 83, 86, 92, 94, 105 pp.

Ayas, G., Altinmakas, E., Rohren, SA., Dogan, H., Dogru, OF., Koselerli, EY., Turksanli, O., Efe, EÖ., Badawy, M., Kamel, S., Patel, P., & Elsayes, KM. (2023). Seeing Radiology Curricula Through Turkish Medical Students' Eyes: A Survey of Turkish Medical Schools' Radiology Education. J Med Educ Curric Dev, 10, 23821205231181990. https://doi.org/10.1177/23821205231181990

Bailey, JH., Roth, TD., Kohli, MD., & Heitkamp, DE. (2014). Real view radiology-impact on search patterns and confidence in radiology education. Acad Radiol, 21(7), 859-568. https://doi.org/10.1016/j.acra.2013.11.022

Chew, C., Cannon, P., & O'Dwyer, PJ. (2020). Radiology for medical students (1925-2018): an overview. BJR Open, 2(1), 20190050. https://doi.org/10.1259/bjro.20190050

Clements, W., Zia, A., Srinivas, A., Davis, J., & Goh, GS. (2022). A prospective cross-sectional study assessing teaching of interventional radiology across 20 Australian medical schools, endorsed by the Australian Medical Students Association. CVIR Endovasc, 5(1), 66. https://doi.org/10.1186/s42155-022-00344-9

Creagh, S., Pigg, N., Gordillo, C., & Banks, J. (2021). Virtual medical student radiology clerkships during the COVID-19 pandemic: Distancing is not a barrier. Clin Imaging, 80, 420-423. https://doi.org/10.1186/s42155-022-00344-9

Döring, N. (2023). Forschungsmethoden und Evaluation in den Sozial- und Humanwissenschaften [Research methods and evaluation in the social and human sciences] (6th ed.). Berlin: Springer. 329-332, 337-338, 342 pp. https://doi.org/10.1186/s42155-022-00344-9

European Society of Radiology (ESR). (2022). Attracting the next generation of radiologists: a statement by the European Society of Radiology (ESR). Insights Imaging, 13(1), 84. https://doi.org/10.1186/s42155-022-00344-9

Grimm, LJ., Fish, LJ., Carrico, CW., Martin, JG., Nwankwo, VC., Farley, S., Meltzer, CC., & Maxfield, CM. (2022). Radiology Stereotypes, Application Barriers, and Hospital Integration: A Mixed-methods Study of Medical Student Perceptions of Radiology. Acad Radiol, 29(7), 1108-1115. https://doi.org/10.1016/j.acra.2021.08.020

Gunderman, RB., & Bedi, HS. (2013). The Two-Minute Teacher. Acad Radiol, 20(12), 1610-1612. https://doi.org/10.1016/j.acra.2013.04.021

Gunderman, RB., Siddiqui, AR., Heitkamp, DE., & Kipfer, HD. (2003). The vital role of radiology in the medical school curriculum. AJR Am J Roentgenol, 180(5), 1239-1242. https://doi.org/10.2214/ajr.180.5.1801239

Jorgensen, DL. (2020). Principles, Approaches and Issues in Participant Observation. London: Routledge. doi: 10.4324/9780367815080. 2-3, 11-12, 36-37, 52, 123 pp. https://doi.org/10.4324/9780367815080

Kelly, AM., & Slanetz, PJ. (2015). Radiology Education: Creating Tomorrow's Radiologists with Yesterday's Budgets! Acad Radiol, 22(10), 1211-1213. https://doi.org/10.4324/9780367815080

Kemp, K., Baxa, D., & Cortes, C. (2022). Exploration of a Collaborative Self-Directed Learning Model in Medical Education. Med Sci Educ, 32(1), 195-207. https://doi.org/10.1007/s40670-021-01493-7

Kirch, SA., & Sadofsky, MJ. (2021). Medical Education From a Theory-Practice-Philosophy Perspective. Acad Pathol, 8, 23742895211010236. https://doi.org/10.1007/s40670-021-01493-7

Lareau, A. (2021). Listening to People. A Practical Guide in Interviewing, Participant Observation, Data Analysis, and Writing It All Up. Chicago and London: The University of Chicago Press. 151, 162 pp. https://doi.org/10.7208/chicago/9780226806600.001.0001

Leschied, JR., Knoepp, US., Hoff, CN., Mazza, MB., Klein, KA., Mullan, PB., & Kelly, AM. (2013). Emergency radiology elective improves second-year medical students' perceived confidence and knowledge of appropriate imaging utilization. Acad Radiol, 20(9), 1168-1176. https://doi.org/10.1016/j.acra.2013.05.011

Li, D., & Brown, AD. (2023). Clinical Exposure to Interventional Radiology During Clerkship: A National Assessment of Canadian Medical Schools. Can Assoc Radiol J, 74(2), 462-464. https://doi.org/10.1177/08465371221134717

Liu, TH., & Sullivan, AM. (2021). A story half told: a qualitative study of medical students' self-directed learning in the clinical setting. BMC Med Educ, 21(1), 494. https://doi.org/10.1186/s12909-021-02913-3

Murphy, KP., Crush, L., O'Malley, E., Daly, FE., O'Tuathaigh, CM., O'Connor, OJ., Cryan, JF., & Maher, MM. (2014). Medical student knowledge regarding radiology before and after a radiological anatomy module: implications for vertical integration and self-directed learning. Insights Imaging, 5(5), 629-634. https://doi.org/10.1007/s13244-014-0346-0

Naeger, DM., Phelps, A., Kohi, M., Elicker, B., Ordovas, K., & Webb, EM. (2013). Reading room electives: say goodbye to the "radi-holiday". J Am Coll Radiol, 10(6), 442-448. https://doi.org/10.1016/j.jacr.2012.09.023

Oancea, L., Gunderman, R., Carrico, C., & Straus, C. (2013). Teaching radiology in medical school: an association for medical student educators in radiology survey. Acad Radiol, 20(2), 255-256. https://doi.org/10.1016/j.acra.2012.09.021

Petsch, I., Velasco González, A., & Buerke, B. (2020). Multidisciplinary Conferences for Radiology Teaching: Why Medical Students Should See the Significance of Imaging and Lifelong Learning. European Journal of Teaching and Education, 2(4), 1-9. https://doi.org/10.33422/ejte.v2i4.308

Petsch, I., Velasco González, A., & Buerke, B. (2021). Teaching Radiology Courses: How to Address Learning Needs of Medical Students Through Interacting in Radiology. European Journal of Teaching and Education, 3(1), 44-51. https://doi.org/10.33422/ejte.v3i1.400

Rahim, S., & Ros, P. (2016). Moving Away From Spoon-Feeding as a Teaching Style in Radiology. AJR Am J Roentgenol, 207(6), 1232-1238. https://doi.org/10.2214/AJR.16.16694

Rizvi, T., & Borges, NJ. (2020). "Virtual Radiology Workstation": Improving Medical Students' Radiology Rotation. Med Sci Educ, 30(1), 117-121. https://doi.org/10.1007/s40670-020-00920-5

Rohren, SA., Kamel, S., Khan, ZA., Patel, P., Ghannam, S., Gopal, A., Hsieh, PH., & Elsayes, KM. (2022). A call to action; national survey of teaching radiology curriculum to medical students. J Clin Imaging Sci, 12: 57. https://doi.org/10.25259/JCIS_36_2022

Schweitzer, AD., & Sarkany, D. (2020). The Importance of the Clinical Internship for the Radiologist. Acad Radiol, 28(9), 1292-1295. https://doi.org/10.1016/j.acra.2020.05.028

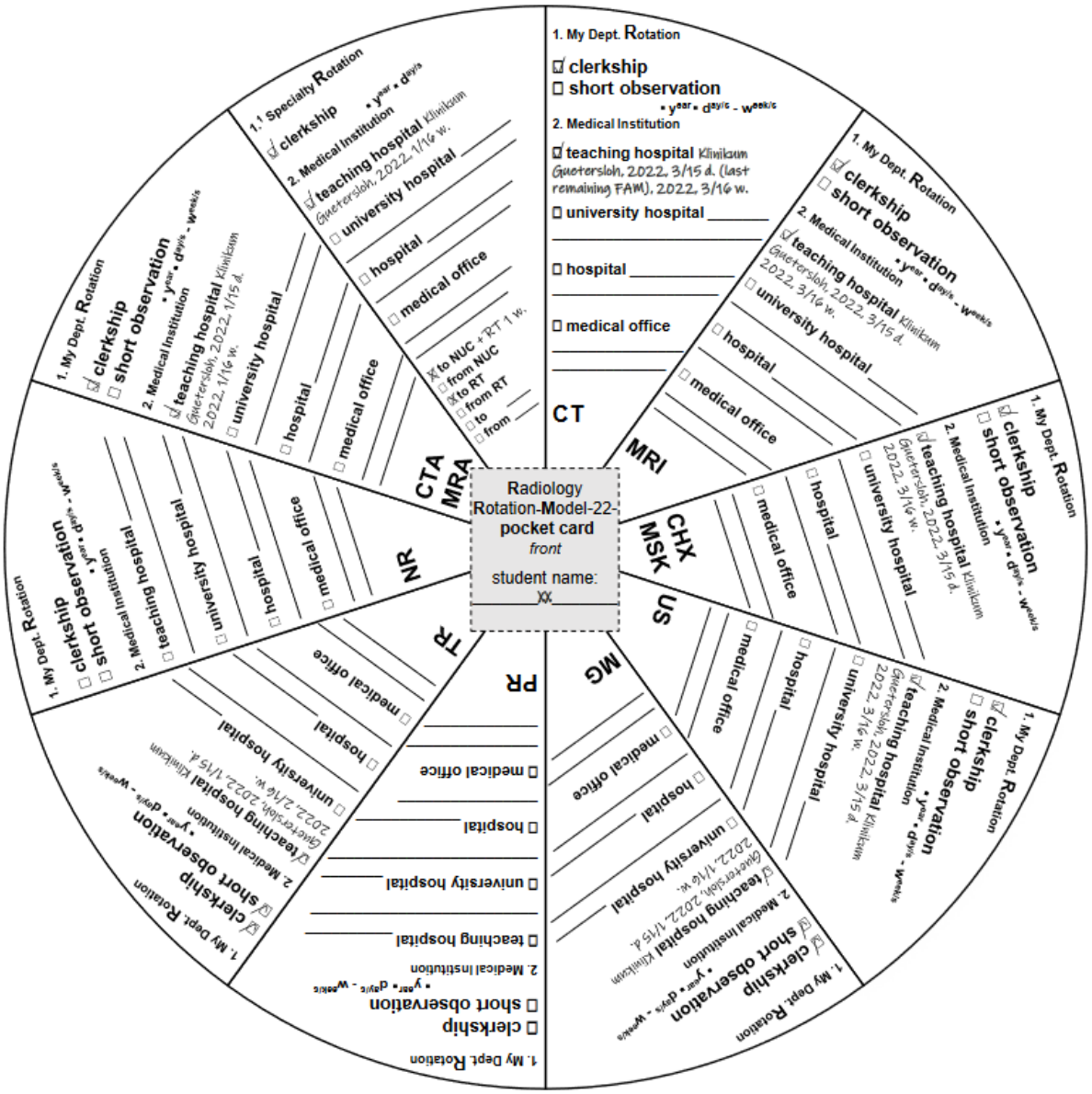
van Ophuysen, S., Bloh, B., & Gehrau, V. (2017). Die Beobachtung als Methode in der Erziehungswissenschaft [Observation as a method in education science]. Konstanz and Munich: UVK Verlag. 53, 82-83, 80 pp. https://doi.org/10.36198/9783838548623

Zierer, K., Speck, K., & Moschner, B. (2013). Methoden erziehungswissenschaftlicher Forschung [Methods of educational research]. Munich: Reinhardt Verlag. 84-87, 89-90, 93 pp. https://doi.org/10.36198/9783838540269

Appendix

Appendix A

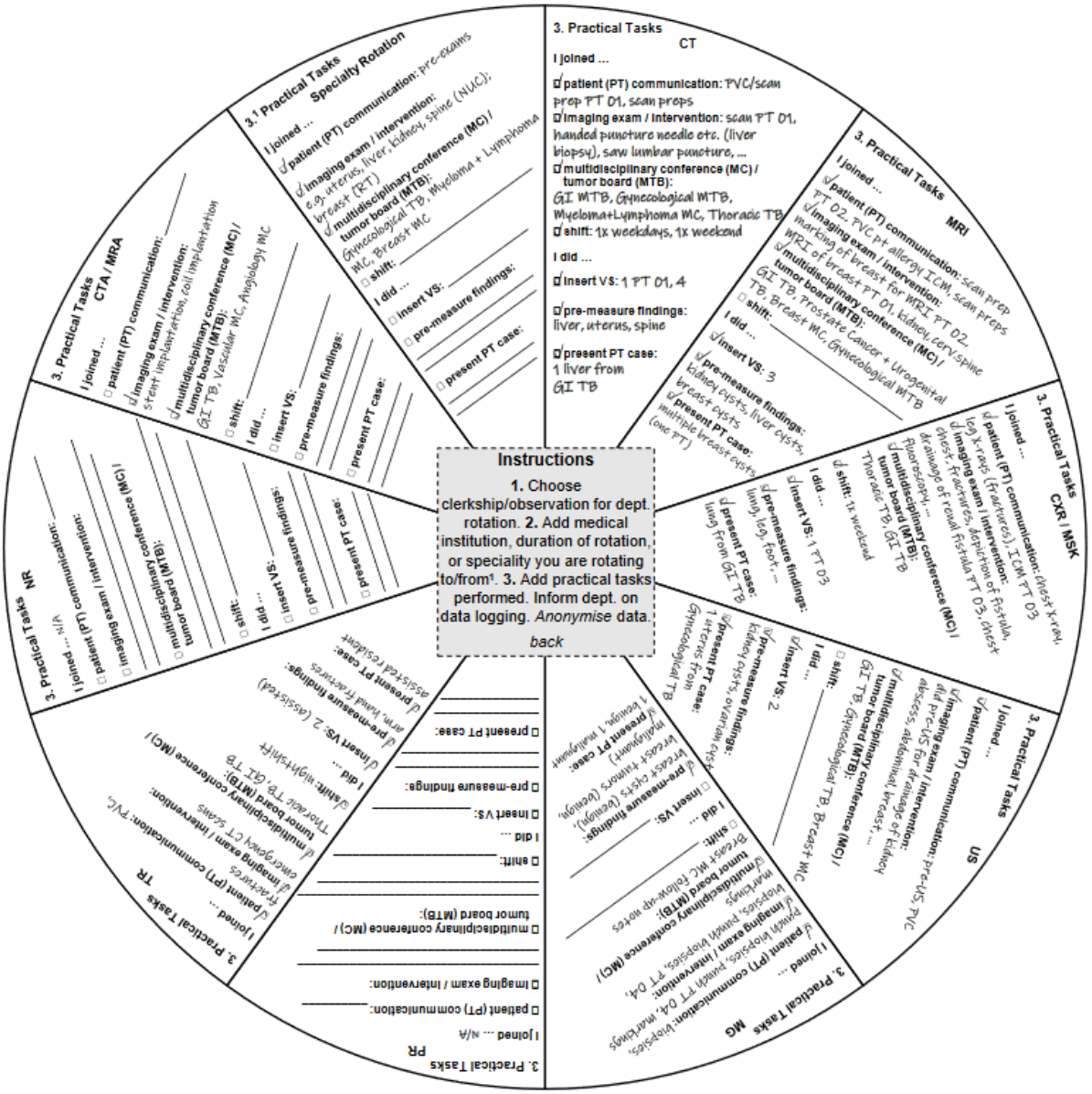
Example Logging on Illustrated RRM-Pocket Card's Front Side



Note. Example logging of one student during two clerkships in diagnostic and interventional radiology at a teaching hospital in Germany (2022), from the Radiology Rotation-Model-22 for clerkships and short observations in radiology, as modified own presentation model based on documentation structure according to Zierer et al. (Zierer et al., 2013)

Appendix B

Example Logging on Illustrated RRM-Pocket Card's Back Side



Note. Example of one student's logging of rotations during two clerkships in diagnostic and interventional radiology at a teaching hospital in Germany (2022), on RRM-pocket card's back side with 3rd section, from the Radiology Rotation-Model-22 for clerkships and short observations in radiology, as modified own presentation model based on documentation structure according to Zierer et al. (Zierer et al., 2013)