Research article

Mentoring in radiology: An asset worth exploring!

Alberto Vieira a, Matthias M. Cabri b,*, Suzanne Spijkers c, Ana C. Vieira d, Mario Maas e

a FMUP: Universidade do Porto Faculdade de Medicina, Hospital CUF Porto, Portugal
b University of Amsterdam Amsterdam UMC, Location AMC Department of Radiology and Nuclear Medicine, Meibergdreef 9, 1105 AZ Amsterdam, the Netherlands
c University Medical Center Utrecht, Department of Radiology and Nuclear Medicine, Heidelberglaan 100, 3584 CX Utrecht, the Netherlands
d University of Amsterdam Amsterdam UMC, Location AMC Department of Radiology and Nuclear Medicine, Division of Musculoskeletal Radiology, Meibergdreef 9, Room G1-211, 1105 AZ Amsterdam, the Netherlands
e Hospital CUF Porto, Portugal

ARTICLE INFO

Keywords:
Mentoring
Radiology
Reciprocity
Communication

ABSTRACT

Residents experience high pressure to be successful in both their career and in keeping up an optimal work-life balance. With a mentoring program, faculties can alleviate stress and provide help for their residents. It is now well established that mentor-mentee relationships during medical school, have influence in career decisions and professional identity formation. The same can be said for mentor-mentee relationships during radiology residency.

In general, universal rules of mentoring are also useful and applicable in the field of radiology. These universal rules for establishing a successful mentoring relationship include creating a relationship of trust and confidentiality, clearly defining roles and responsibilities, establishing short- and long-term goals, using open and supportive communication, and collaboratively solving problems.

The institutions and the radiology departments should be well prepared and aware of the responsibility to have trainees, providing time for mentors to dedicate to their academic duties. They have to implement strategies to effective mentor matching and orientation as well as the ability to provide evaluation with qualitative feedback. Periodic assessment should be warranted together with the incorporation of new technology as it plays a critical role in the training of millennial radiologists as they take the profession into a technology-laden future of medical imaging.

1. Introduction

1.1. What is mentoring?

Defining the ‘what is mentoring?’ question seems an easy task until you are appointed or elected as a mentor and have no idea what exactly is expected of you. Whilst the system of mentoring is certainly not new, Homerus wrote about it in Odyssey [Table 1], the exact completion of expected of you. Whilst the system of mentoring is certainly not new, Homerus wrote about it in Odyssey [Table 1], the exact completion of

Joebi and Bozeman described the following elements to mentoring: firstly, the focus of mentoring needs to be on achievement or growth. Secondly, this focus is achieved through support on both the emotional and psychological level. This includes both career development and role modeling. Thirdly, two-way communication is essential. The communication is preferably informal and reciprocal. And lastly, both authors emphasize that the mentors use their experience as a means to help the mentee [19,20]. More specifically: the mentor’s experience needs to be beneficial for the mentee. The other way around is not described in these definitions.

2. It’s all about reciprocity

Is the mentor only providing? No, there is definitely a consumer’s role in which the senior learns from the mentee. Modern literature
These factors, combined with less autonomy and a high level of work-life interference has contributed to the high number of burnouts as well as quantity of production and extra-curricular activities such as teaching.

Friendship and coaching [1]. Although helpful and certainly an important element of the definition of mentorship.

The etymology of Mentor.

Table 1

| Etymology: | and the prince sat down as Mentor took the floor, Odysseus’ friend-in-arms to whom the king, sailing off to Troy, committed his household, ordering one and all to obey the old man and he would keep things steadfast and secure. [Excerpt from Homer ‘Odyssey’] |

describes a role for the so-called reverse mentoring in medical education [21]. The possibility to talk in depth to people in young adulthood becoming a professional is valuable. It helps seniors to keep connected to young people’s problems, aiding in keeping up to date to other current societal dilemmas. Also, a form of energy is harvested from talking to a mentee. For someone with a helping personality a certain satisfaction and altruism is derived from helping a mentee. Learning to cope with new equipment and technological options is something radiologists are used to. However, many of the tips and tricks often come from a younger generation. Senior radiologists could use that knowledge to work more efficiently and keep up to date with the latest technological improvements.

Taken together, a mentor–mentee relationship is not only beneficial for the mentee. While mentees benefit from mentors with experience in not only their field of medical expertise but also in balancing work life and family life [22], mentors benefit from these relationships as well. Not only do they attain personal growth, intellectual stimulation but also the sense that they can provide back for the department [22–24].

Whilst faculties often provide a stripped-down version of mentorship, mostly in the form of organized, yearly recurring conversations with the faculty in charge of residency program. Residents do not instantly perceive this formal or even informal faculty conversation as mentorship [2]. Although these conversations open up the possibilities for building up stronger relationships, they lack the consistency and longitudinal nature truly needed for mentorship. Same goes for advice from a research supervisor on a specific topic. This is not considered mentorship by residents as the advice is often topic specific and does not build a connection between the supervisor and resident. There is also no development on personal emotion. The distinction between advice and mentorship is important to make. Advice, whilst helpful, is often a short-term solution for a certain specific problem. It does not guide a resident and does not help on issues concerning personal and professional development. Although faculty sometimes appoint supervisors as mentors, the residents perceive a difference. Same goes for peer support, friendship and coaching [1]. Although helpful and certainly an important part of both personal and professional development, it lacks several elements of the definition of mentorship.

2.1. Why is mentoring important?

Residents experience high pressure to be successful in both their career and in keeping up an optimal work-life balance [25–28]. With the rise of dual-income and single-parent households and the increase of female physicians over the last decades, most residents nowadays have to combine traditional household duties and taking care of children with their career. In addition, the nature of work in the medical field has changed, being more and more defined in terms of research output, quantity of production and extra-curricular activities such as teaching. These factors, combined with less autonomy and a high level of work-life interference has contributed to the high number of burnouts as well as doubts and disappointment concerning the chosen career path resulting in a high drop-out rate, especially in the first years of training [23,25,28,29].

A mentoring program enables the ability to address concerns and doubts of young professionals at the very moment that they are present. Literature shows that a mentoring program positively influences research output in terms of the number of articles and received grants, leads to better career opportunities and improves the mentees confidence. Furthermore, formal mentorship programs reduced burnout rates and stress [30]. And the most important benefit of a mentoring program might be that mentees were shown to have greater overall career satisfaction [16,22,23,31–34].

Ultimately, a successfully implemented mentoring program thus enhances work satisfaction, clinical productivity and research output, while at an institutional level giving substance to faculty retention and improved leadership in the future generation [23,31].

2.2. What are radiology specific rules for mentoring?

There are specific circumstances for radiology residents that influence the nature of the mentoring relationship. For example: during radiology residency, the resident has to acquire a high amount of knowledge, concerning a wide range of medical topics. Discussing study skills during mentoring is therefore important [35].

Lastly, it was shown that there is often a discrepancy between what mentors feel they provide to the mentee (radiology specific career advice, choice of subspecialty) and what the mentee feels is the most covered topic in mentoring sessions (general work-life balance, study skills) [35]. It is important to realize that radiology specific expectations of mentors and mentees should align to make the most out of the mentoring relationship.

2.3. How does one start with mentoring?

Although the inspiration or motivation to start with mentoring might come from an individual, the department in charge of residency needs to take a clear stand on this. Mentoring is a group effort and in order for the group to succeed, certain game rules can aid in achieving success. We aim to provide a basis for setting up and moving on with mentoring.

The goal of the relationship needs to be defined by the department. The ultimate goal should be to lead the mentee to a state of independent professionalism and aiding the resident with both career decisions and personal wellbeing [24].

As a department, you start with gathering the faculty and senior radiologists and together form a mentoring committee. This committee is responsible for program oversight, evaluation and smoothly occurring of the mentoring sessions [36]. The committee writes a blueprint for the department. This blueprint contains the ground rules of mentoring: mutual respect, open communication, clear expectations and confidentiality [24]. It is further advised to communicate two of the most important elements of the mentoring program: the acceptance to be a mentor and the willingness to teach and learn [36].

2.4. Deciding on a mentor

The success of mentorship is largely dependent on a reciprocal and effective mentor–mentee relationship. Because of the importance of a reciprocal relationship, it is important to organize the selection of a mentor as early as possible. Even before the mentee has started residency, it is possible to get to know each other.

Unlike the usually used paternalist method the mentees should have the opportunity to know the staff beforehand and to choose their mentor as the person that most fulfill their needs and expectations on their future carrier [24,37,38]. Mentee’s who choose their own mentor, instead of getting one assigned, reported greater satisfaction, communicated more with their mentor and reported greater aid in growth and development [24,32,39–41].

Each mentor has a certain set of skills and experience. We advise to let your mentees choose more than one mentor to make sure all domains are covered in the communication [24,39,42]. Some mentors have more experience with work-life balance or family time. Others with specific
educational or academic skills [2]. Matching based upon subspecialty interest is also an option [40].

Also, needs of residents are changing over the years making it necessary to keep evaluating whether all domains are covered during the residency. When guidance for a very specific topic is needed, a mentor from outside the radiology department is also a possibility [36].

2.5. Peer mentorship

Peer mentorship, or horizontal mentorship, is a valuable form of mentoring, commonly used by residents. A great deal of advice concerning books, websites, systems, people, tips and tricks and most importantly the unwritten rules [43], are handed down through these canals. These mentorships encourage collaboration and are informal and easily accessible. There is however a limit in experience and knowledge for career and personal advice. Peer advice is not always perceived as advice in the best interest of the mentee [2].

2.6. Requirements for mentee’s

In order to make the relationship work, some investment is required by the mentee. The dos and don’ts are listed in Table 2.

2.7. Requirements for mentors

For a mentor it is important to be aware of your own skills and competence outside of your radiology subspecialty. In order for the department to showcase each mentor’s ‘specialties’, you need to be open and honest about how you managed your own personal challenges [22]. Be aware that a mentee might choose you based on those experiences and allow your mentee to approach others for different advice. As a mentor it is important to create time for your mentee and be genuinely interested. A list of dos and don’ts is summarized in Table 3.

Regarding the number of mentee’s per mentor, we advice to have no more than two mentee’s to be able to properly mentor and schedule. Wadhwa et al. created the three C’s of mentoring: competence, confidence and commitment [42]. These are important elements and form the basis of your mentoring style. With genuine interest and time, a lot can be achieved for both parties. It is important to notice that if the relationship fails, neither parties should feel at fault [44].

2.8. What support do you need?

There are also several characteristics that have been identified as effective for a successful mentor–mentee relationships which should be taken into mind by the head of departments. There should be a careful selection and preparation of your mentors, an effective pairing system based on mutual commitment, maintenance of confidentiality and mutual respect as well as a clear definition of expectations [35].

Faculty needs to provide a document with the defined responsibilities, goals and scope of the mentorship program to all medical staff [32,36,40]. The institutions and the radiology departments should be well prepared and aware of the responsibility to have trainees, providing time for mentors to dedicate to their academic duties. They have to implement strategies to effective mentor matching and orientation as well as the ability to provide evaluation with qualitative feedback [24]. Ideally faculty provides a teaching program to all mentors equipping them with the proper skills to appertain mentorship [40]. In order to acknowledge the importance of successful mentorship, consider an award or other non-monetary reward for mentorship [32,37].

2.9. Where do you talk to your mentee?

Because of ease, most conversation will happen on the workplace. There is little evidence to which place is most suited for these conversations. Only a minority reported to socialize with their mentor outside of the workplace [46].

2.10. How often do you converse with your mentee?

The frequency of meetings is mainly up to the mentee. They are the initiators of the meetings and its contents. Some faculties report ‘quite a bit’ of these meetings [46]. Often a yearly, half-yearly or quarterly meeting is scheduled by the department as a basis [36,40]. With this basis both the mentor and mentee can agree upon a more fitting interval. Because availability is a major contributor to the success of the program, we advise to plan easy access to each-others schedules.

2.11. How to evaluate

Evaluation of the mentorship as a whole, is based on the overall satisfaction from all participating parties. For faculty it is important to determine if goals are achieved [44]. For mentor’s and mentees, it is important to rate satisfaction, progress and outcomes throughout the year. The input from all parties aids in iterative improvements of the mentorship as a whole. All parameters can be quantified and held against the initial goals and scope of the program. It is up to the faculty to determine ownership of the program. We advice to let all staff be responsible for the mentorship program, goals and outcomes. Shared ownerships aids in motivation to make the program a success.

2.12. Special notice: Woman and minorities

Due to the sensitive nature of mentoring and the theory that woman might experience more stress when handling the combination of career and family, it is beneficial to advice female residents to match with

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**Table 2** Requirements for mentee’s.

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<thead>
<tr>
<th>Requirements for mentee’s</th>
<th>Don’ts</th>
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<tbody>
<tr>
<td>Understand your own needs</td>
<td>Not paying attention</td>
</tr>
<tr>
<td>Seek mentors with experience matching your needs</td>
<td>Be competitive with others</td>
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<tr>
<td>Be respectful of the mentor’s time</td>
<td>Break confidence</td>
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<tr>
<td>Respect deadlines</td>
<td>Act contrary to words</td>
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<tr>
<td>Be prepared for meet-ups by having questions ready beforehand</td>
<td>Criticize and disapprove</td>
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<tr>
<td>Explicitly enquiring the expectations of your mentor</td>
<td>Act with hidden agenda</td>
</tr>
<tr>
<td>Take ownership of the relationship by guiding and facilitating meetings</td>
<td>Blame others for mistakes</td>
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<tr>
<td>State your own expectations</td>
<td>Keep a closed mind to new ideas</td>
</tr>
<tr>
<td>Actively seek feedback</td>
<td>Discourage others from taking risks</td>
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<td></td>
<td>Project a negative perspective</td>
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**Table 3** Requirements for mentors.

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<tr>
<th>Requirements for mentors</th>
<th>Don’ts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have adequate clinical skills</td>
<td>Withhold networking opportunity’s</td>
</tr>
<tr>
<td>Break up on teaching and feedback skills</td>
<td></td>
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<tr>
<td>Spend time with mentee’s</td>
<td>Do not mentor when you are the department chairman</td>
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<td>Demonstrate enthusiasm</td>
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<tr>
<td>Have a positive attitude</td>
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<td>Be honest and integer</td>
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<td>Be prepared for meet-ups by having questions ready beforehand</td>
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<td>Actively seek feedback</td>
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female faculty members [22,32,40]. This acknowledges and hopefully further encourages the rise of female role models in radiology.

For minorities, deciding on a mentor of a similar background can be challenging. Overall, minorities prefer a mentor of a similar background if present in the faculty [22].

2.13. Should we provide a non-radiology mentor for radiology residents?

The mentorship program doesn’t have to be centered only in a two-person relationship. During the process of mentorship, the mentee can take advantage of having multiple mentors to fulfill each of his professional needs [24,37,42,47]. Indeed, having a senior diagnostic radiologist as a clinical mentor maybe is not enough to build a good radiologist. The idea would be to complement this mentorship program with mentors from different fields in order to enrich the experience of the mentees. For example, to have an orthopedic surgeon as a mentor of a musculoskeletal radiologist can provide a more clinical and practical approach to the patient or having a physicist as an academic mentor can ensure a more fruitful scientific production.

It is now well established that mentor–mentee relationships during medical school, have influence in career decisions and professional identity formation [48].

Applying the same rule to the residency program, it is easy to understand that formative experiences provided by different mentors of different, but interconnected, fields of interest, can shape and influence the future radiologist in making.

Furthermore, has become extremely challenging for a single mentor to meet the various needs of an early academic career. Non-traditional mentoring programs with multiples mentors from different areas of expertise, for example mentors from multiple areas of specialization, offer greater opportunity for success than having a single mentor during the entire residency program [24].

2.14. Best practices and recap

The task of being a mentor requires a lot of time and dedication. The academic world is becoming more and more demanding with people asked to do more in less time so it is becoming increasingly harder to encourage people to dedicate time to teach, lecture, read or produce scientific work [23,37].

To ensure that this 5-year relationship lasts and that both expectations involved are fulfilled, a contract should be redacted in the beginning of the journey outlining the objectives, goals and expectation of both the mentor and the mentee and it should be discussed in the end of every year to make sure they are on the correct track [23,37]. As expectations and desires can change along the way, to have a third or fourth person involved can be helpful [37].

The European training curriculum should always be on the base of the training program as it is a living document, reviewed at regular intervals in order to keep up with current development in the profession. The current version of the European training curriculum is focused on the scientific base of the profession. However, the authors believe that the inclusion of non-technical skills as part of the required components of training is an essential tool for the success of the future generations of Radiologists.

3. The future

Residency education has evolved during the last decades as residents seem to have different needs and expectations. A residency program with excellent clinical outcomes appears not enough to satisfy the young generation. It is necessary to recognize the need to have a program not only based on clinical radiology but also in education, leadership, global health, quality improvement, health care economics and health policy as essential skills for the future generation of radiologists [49].

Curricular modernization should occur with the inclusion of non-clinical skills as younger generations desire more control over their educational pursuits. This will provide skills that are not routinely taught as a potential powerful advantage in their future career as it potentially empowers them to take on future leadership roles [49].

Furthermore, meaningful interactions between residents and role-models should be fomented as they provide opportunities for interpersonal coping mechanism of modeling, contributing to improve resident welfare [48].

Successful mentoring relationships are dependent on both the resident and the mentor. Today’s radiology trainees belong to the millennial generation. A generation that grew up immersed in technology, avid of constant information and feedback. For this reason, the mentors are asked to innovate education to include online resources and social media mechanisms along with traditional lecture-based learning [50].

With the rise of systems using artificial intelligence (AI), the question arises whether mentoring is a task that can be handed over to a computer system. Considering all the requirements necessary for good mentorship it is not easy to meet every condition. Why not automate where possible? Some systems use intelligent chatbots for coaching although not for mentoring [51]. Other specific systems are built to substantiate certain aspects of mentoring [52]. Think about notifications via a smart system when intervention is needed or using AI to provide just in time feedback. Even notifying both mentor and mentee about new signals concerning mental health is being explored. The potential problems lie in the way AI work. These AI systems rely on mathematical equations and need to be used whenever possible to achieve a better outcome. The mentoring conversations however are emotional based and we found no systems yet, capable on replacing humans.

Although innovation seems to be the driver to success learning and engaging of the new generations, some old rules still apply. A well-defined training program with clear objectives and specific, measurable, attainable, realistic and time-bound tasks, should be provided to the trainee.

Other important feature is to provide time for resident self-development. Independent and peer-to-peer learning processes are popular between new generations and the institutions should be able to provide free-time for the development of researches, teaching or scientific production, for example [50].

Mentoring programs should also incorporate innovative forms of mentoring such as mentoring networks, collaborative mentoring and peer mentoring networks as they can potentially overcome traditional single mentor limitations as personality conflicts, emotional and professional dependency, narrowness of mentor perspective and mentor time availability [24].

Mentoring networks will provide multiple mentoring partners enabling a coverage of a variety of topics such as research, teaching or work life balance. Collaborative mentoring use mentors from different departments to warrant professional development, career planning and emotional support. Peer-mentoring network should also be promoted as it capacitate the residents with specific skills as the capability to develop collaboration, negotiation and conflict resolution [23,24].

To know and understand the organization where the mentoring program is being implemented as well as establishing strong mentorship strategies have a pivotal role in early career development. Periodic assessment should be warranted together with the incorporation of new technology as it plays a critical role in the training of millennial radiologists as they take the profession into a technology-laden future of medical imaging [24,50].

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.
Vieira:

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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