



## Practice What you Preach: Does the Orthopaedic Medical Practice Support Lifelong Learning?

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**Received:** October 28, 2025

**Published:** November 14, 2025

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### Abstract

**Background:** Medical knowledge is quickly changing and skills for patientcare are rapidly evolving, urging medical doctors to be lifelong learners (LLL). For surgical residents "Role modelling", especially in the theatre, is considered the centrepiece of their learning. Are surgeons able to be role models for residents? What are relevant teaching- and learning experiences and what are the **facilitators and barriers?**

**Method:** This qualitative study investigates how orthopaedic surgeons and residents interact in theatre. Video observations and semi-structured interviews identify whether the mind-set of residents and the enacted messages delivered in their workplace are coherent with the requirements needed for LLL.

**Results:** The theatre is a rich learning environment. Feedback from orthopaedic surgeons for residents is important, as are assessment questions and reflective discussions. Residents generally have a learning mind-set; they prosper from a relaxed atmosphere especially when surgeons show confidence in their workmanship and when they share the responsibility towards patientcare. However, time pressure and early job take over inhibits teaching and learning, the skewed resident-surgeon power relation has a negative effect on learning and teaching.

**Conclusion:** The operating theatre is a rich and relevant workplace where residents can practice skills they need for lifelong learning. Orthopaedic surgeons support learning. They can be more open to feedback and reduce power inequality; this will improve the lifelong learning skills of the residents. The time available for teaching and learning at the workplace is essential to a favourable outcome.

**Keywords:** Lifelong Learning (LLL); Orthopaedic Surgeon

## Introduction

Learning is a process of becoming aware of the frame of reference within which we think, feel, act, and become critical. Learning leads to the development of newer more adequate frames [1]. There are various forms of learning: formal, informal, and non-formal learning. These three forms of learning unify to form Lifelong Learning (LLL). LLL is a supportive process which invigorates and empowers people to obtain the knowledge, attitudes, and skills, they will require through their lifetimes and apply them with confidence and creativity [2]. LLL is crucial in medical education given the rapidly evolving knowledge and skills required for patientcare. This professional competency should be acquired and maintained by learners during undergraduate and postgraduate medical education [4,5].

Physicians should support the learning mindset for LLL, they need to encompass flexibility, and have long-term perspectives on learning [6]. However, the performance-oriented nature of medical education may hinder the development of the learner's mindset [7]. To be effective lifelong learners, individuals must consciously direct their development, turning workplace experiences into realistic and achievable learning objectives and being allowed to make mistakes [8]. In the work environment educators struggle between taking control and allowing residents independence [9]. Educators' ability to recognize and utilize learning opportunities varies, influenced by contextual, personal, and interpersonal factors [10]. Engaging in reflection in and on action, can help surgeons to truly value feedback. This acquires awareness of their own behaviour, combined with a willingness to learn and improve [10]. Educators open to feedback and aware of training opportunities will guide learners in their development.

Modelling students witness has the most powerful effect on their professional development [5,11,12]. Role modelling, therefore, is an effective teaching method in medical education, but do current medical educators show a learning mind-set with opportunities to learn from mistakes? Workplace learning is inherently

value-laden [13]. The current educators may have different values being educated in a performance-oriented learning environment. Since, they are responsible for today's-day-to-day work and their morals and ethics might be different than in the current expected learning ethics because medical education has changed over time. This study explores how orthopaedic surgeons and residents interact in daily practice to assess the alignment between learning practice, focussing on learning opportunities required for LLL skills.

## The research questions are

- To what extent does surgeons' behaviour and their interactions with residents support the resident in learning and in developing LLL competencies?
- What are the enablers and barriers in the interaction between surgeon and residents supporting lifelong learning in orthopaedic theatre?

## Methods

This qualitative study adopted a constructive grounded theory approach from the qualitative research methodology that attempted to unravel the meanings of people's interactions, social actions, and experiences [14]. Seeking to understand the environment in which the residents and surgeons work and refine the understanding of LLL in residency training. To least intervene with daily practice, non-participant video observations in theatre were performed to collect information on the behavioural aspects. Audio recordings were made to be informed on the interaction between residents and the orthopaedic surgeon. The videos were taken during a routine operating day at the Maastricht University Medical centre. The procedure is always recorded with video cameras in the theatre and the team is accustomed to being recorded. The teams all consisted of a resident-in-training and a consultant being the supervisor of this resident over a longer period. The recorded procedures contained the regular operating program meaning 3 to 5 operative procedures per day per team varying from primary prosthesis knee/hip and revision surgery to paediatric orthopaedic surgery.

A semi-structured interview with all participants, separately, was scheduled (30 min) using an interview guide offering the participants freedom to express their views in their own terms. During the interviews participants reflected on their learning experience and on the atmosphere. In total 10 videos of 5 couples (18 operative procedures) and 10 interviews were collected. Interviews were written down in memos. The data collection was done by a selected research team which was composed by the main researcher. The research team was built with representatives of different groups, all interested in education but with different backgrounds (resident, orthopaedic surgeon, general surgeon, educationalist).

### Data-analysis

The iterative analysis process began with individual review and coding of videos using an observation guide. The team evaluated the video recordings and the matching notes focussing on experiences of the participants, the feedback and self-reflective behaviour, the non-verbal communication, and interaction dynamics. Subsequently, the team employed open, axial, and selective coding stages to conceptualize LLL within the learning environment. They discussed the relevance of each item and its relevance on LLL, connection to learning mind-set, the opportunities to learn from mistakes, and highlighted the most relevant quotes. The power relation within the couples were considered. Final discussions resulted in defying the coding into the following preliminary categories: Content and organization, Time management and environment structure, do and explain, discuss, self-assessment, feedback, preventing mistakes, stay sharp/mind-set, social interaction, autonomy, and training atmosphere. Next the preliminary categories and the coding of the remaining items were reviewed leading to the following additional categories: external factors and leading by example. Data was collected and analysed until no new concepts came up. In the result section quotes from the participants are placed between quotation marks.

No funding was received. Ethical approval of the NVMO (Dutch society of medical education) was obtained, file number 2022.7.4.

### Results

The technical quality of the videos is good, and the sound is excellent, making it possible to analyse the communication. Interviews are conducted within 30 minutes. Videos vary in length (14.22 to 35.26 min.). All couples have verbal and nonverbal interaction. Most communication is task related. Some couples have private interactions. Each couple has a different type of interaction and a different approach in their collaboration. Analysis reveals differences between the more and less experienced surgeons. Less experienced surgeons use more words in their explanation, and the time taken to explain the tasks is longer and the explanation is more detailed. The differences between the residents are less clear. All of them ask for information if needed. The number of questions or the time for questions is equal for more and less experienced residents. The level of participation during the procedure does differ. The analysing team consented on the next categories:

### Feedback

Most coding is found in the category “feedback”. Primarily on content or organizational issues. The feedback can be simple like “Very good” or “Well done”, or more complex like: “I know you learned everything from B which is good!” or “Feel the k-wire position, well-adjusted approach” Feedback is mostly positive but can also be critical: “Is not good: you have to act”. Feedback is going both ways in the fragments even though from surgeon to resident is more often observed than vice versa. Residents clearly indicate that they receive feedback every day at the theatre and react to it expressing gratitude: “Thank you” or “That’s important”. Surgeons indicate that receiving feedback helps them to learn:

“It is always nice to get feedback from residents because I can do better myself, it helps me to learn what I can do to provide better education”.

### Leading by example and time management

Residents and surgeons have a non-outspoken work method that varies among the couples. In this collaboration there is always an interaction with the surgeon in the lead. Even with an experi-

enced resident, the surgeon explains things and approaches the resident as learner. The surgeon is leading in a “do and explain” manner. One surgeon reported this clearly in the interview: “Telling a lot about what you do, why you do it”. All surgeons report a feeling of responsibility for training their resident, but also for the entire theatre process. It was explicitly mentioned that all surgeons carry the responsibility for the entire team, the atmosphere, and the time management. Surgeons feel that the time constraints and the daily routine is interfering with their role as teacher and with the learning opportunities. When there is time to spend (e.g. waiting for the anaesthesiologist preparing the patient), there is a vivid case-discussion, the time is used for educational purposes. On the other hand, when there is time pressure, there is no case-discussion, and the residents get short and clear orders with limited opportunities to ask questions. Time pressure decreases the willingness or opportunity to teach: All residents state that time pressure deteriorates the learning climate.

### Learning from daily practice

All interviews and video observations highlight the training atmosphere in the theatre. The theatre is indicated to be the primary learning environment for residents: “Every day in the theatre is a learning day, I’m there because I want to learn.” This quote is from a less experienced resident. Experienced residents indicate the theatre to be their most important learning environment, they also indicate that their learning curve is flattening. In every video the residents are active learners, they pose questions and are open to feedback. Interviews also show a clear learning mind-set: “With the right learning mind-set you learn every day”. The learning mind-set is even more obvious in the discussions where resident and surgeons reflect on their experiences during and after task performance. Surgeons pose questions to stimulate the residents in self-directed learning: “What is your next step and why?”, “What do you think can go wrong?” Or assessment questions “Why do we use ...? How do we use ...?” They discuss the cases and have reflective discussions which is highly appreciated by residents.

### Preventing mistakes and patient safety

All surgeons state that there should be space for mistakes to learn: “Everyone makes mistakes. You can make a mistake, you can discuss it, and you learn from it.” All agree that mistakes should not lead to a patient’s disadvantage. The videos reveal that mistakes are usually prevented by early intervention by the surgeon. More experienced surgeons do not intervene right away but ask guiding questions to give the resident the opportunity to correct the mistake. Confidence of the surgeon relates to the autonomy of the resident. One resident clearly described this mechanism:

“There are differences depending on the surgeon. One takes over faster than the other. If the surgeon has more confidence, you can correct yourself”.

### Personal development and autonomy

Residents as described all accept a learning role, but some residents are leading and others are following, even without clear instruction or conversation about their role. In none of the videos there is a conversation about the tasks or the task division, but non-verbal approval is given by the surgeon. For instance, when the residents take a surgical step, there is no further instruction, but after starting the task there is eye contact and sometimes the surgeon nods in the direction of the residents. One of the residents reflects on this process in the interviews: “Taking on tasks and responsibilities happens naturally, it’s something you take up, but it’s not discussed that way.” Surgeons describe the autonomy of the residents as development in their career to become orthopaedic surgeons: “You decide what role you [resident] can handle”. This is observed well in the videos where the taking over of the task is not always to prevent mistakes but sometimes related to “not taking the rudder” by the resident.

### Power relation

The videos show no visible power issues, although the relation between the resident and the surgeon seemed to be more relaxed

if there is some laughter. This results in more questions by the residents. A more rigid working environment where there are only task related conversations results in less questions. All interviews reveal the clear recognition of power relation in the couples. Most related this to the ultimate responsibility of the surgeon on the outcome of the work. All surgeons indicate to be aware of power relations and attempt keeping the differences to a minimum:

“You are always on a different level; in the end I am ultimately responsible. You try to keep the gradient as small as possible”.

Residents report power relations in their learning position. They were aware of the assessment being done by supervisors: “You always remain dependent on the supervisor and that plays a role in the relationship.”

In table 1 the enablers and barriers abstracted are summarized.

| Category                     | Enabler/Barrier                                               | Quote                                                                                                                                                                               |
|------------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Feedback                     | Enabler: Feedback from surgeon to resident                    | “Every day at operating theatre is a day of feedback”.                                                                                                                              |
|                              | Barrier: Lack off feedback from residents to surgeon          |                                                                                                                                                                                     |
| Leading by example           | Enabler: Sharing responsibility                               | “I will give you an important tip, never forget...”<br>“supervisors are ultimately responsible”                                                                                     |
|                              | Barrier: Time pressure                                        | “Trying to avoid time pressure is essential”                                                                                                                                        |
| Learning from daily practice | Enabler: Theatre environment as learning environment          | “It is always nice when a resident asks why you do something this keeps you sharp in your work.”                                                                                    |
|                              | Learning mind-set resident                                    | “That you get the chance to do things and discuss them with your supervisor and receive feedback on it.”                                                                            |
|                              | Reflective discussions in the team                            | “What do you want to learn?” What do we do next?”                                                                                                                                   |
|                              | Assessment questions from the surgeon                         |                                                                                                                                                                                     |
|                              | Barrier: Dailey routine from work leaves no room for learning | The learning curve is levelling off.”                                                                                                                                               |
|                              | Surgeon responsible for outcome not for learning              |                                                                                                                                                                                     |
| Preventing mistakes          | Enabler: Confidence in resident                               | You take the rudder (responsibility) and show me what you can do                                                                                                                    |
|                              | Barrier Early job take over                                   |                                                                                                                                                                                     |
| Personal development         | Barrier : Unclear task clarity resident                       |                                                                                                                                                                                     |
| Power relation               | Enabler: Relaxed atmosphere                                   |                                                                                                                                                                                     |
|                              | Barrier: Assessor role surgeon                                | “It is always your supervisor and your trainer. It is also someone who assesses you in your education. It’s not necessarily disturbing, but it is always in the back of your mind”. |

**Table 1:** Summary of enablers and barriers of promoting LLL in the practice of the orthopaedic department in the operating theatre, quotes are abstracted from this study.

## Discussion

Video observation offer valuable behavioural and perceptual data. While prior studies have employed video observations in technical procedures, our study uniquely explored communication, behaviour, and perceptions, contributing to the understanding of surgeon-resident dynamics [15-17].

This study affirms residents' commitment to LLL, aligning with finding by Sagasser, *et al.* showing engagement in self-regulated learning, use of feedback, and engage in reflection [18]. Furthermore, residents demonstrate skills essential for effective LLL. We find evidence that surgeons receive and request hardly any feedback. Different explanations could explain this. Firstly, the surgeons all finished their medical training before the introduction of self-regulated learning, their training was performance oriented. The observation of less experienced surgeons being more explicit in expressing their learning might be a result of the changing medical educational paradigm. Meaning that the less experienced surgeons are possibly educated in a more self-regulating orientated curriculum. Secondly, experts [surgeons] have encapsulated their knowledge in problem scripts and can automatically recognize problems and solve them, but the expert no longer knows the individual steps in the script. A novice has not yet automated this and has to take every step consciously. As a result, the working mechanism of the novice surgeon is closer to that of the residents. The surgeons do express their appreciation about receiving feedback but do not request it. Being part of a hierarchical relation where surgeons are always in the lead might limit their ability to display learning goals and ask for feedback. Uneven power distribution between surgeons and residents is evident in this study. This might limit providing upward feedback [19]. If change is needed a more thorough staff education curriculum might be helpful. The residents as experts in self-directed learning can take up a leading role in this education.

This research shows an interesting difference in the approach of the residents depending on the experience of the surgeon. Therefore, it seems possible to promote the learning outcome of the

residents by selecting more favourable couples to work together. Residents needing more autonomy could preferably be assigned to more experienced surgeons. Residents needing a high level of explanation and a high task-specific procedural training could be assigned to work with novice surgeons since during the career the role of medical educator shifts from "deliverer" to "facilitator" [20]. This will enhance the learning outcome and the teacher-learner collaboration.

In this study time constraints are significant barriers to formal and informal learning just as shown by Hoffman, *et al.* emphasizing that patientcare demands can limit learning opportunities, shifting the learning focus to task execution [21]. Irby, *et al.* recognised the problem of having a heavy clinical load, overwhelming any attempt to use teaching methods, they provided time efficient and powerful educational models, (e.g. "one-minute preceptor model," allowing learning when only seconds or minutes exist [22].

## Strengths and limitations

This study is unique in its method and in its setting, providing a rich and detailed insight into a complex work setting. It provides valuable information with practical implementations: organise feedback courses for surgeons with input from residents, select couples more favourable in experience and teaching goals. One of the learning points from this study is to further explore the attitude towards teaching through assistance by the surgeon supervisor.

There is a technical limitation because it sometimes is hard to see the nonverbal communication because the person is not facing the camera, or the face is covered by the face mask. Second limitation is the selection in the operative procedure, as it may not be representative making it difficult to transfer the outcome to other situations or departments. Further limitation is the potential selection bias from the selected couples, couple selection had no scientific support but was based on most logical combinations. Bias might come from the delayed interviews, because interviewed was not available earlier, this might impact the outcome when interviewed had contact with other participants.

### Implications for future research

Future research could explore alternative camera positions to capture non-verbal feedback more effectively. To be better informed about the collaboration of the couples, and about the effect higher stress has on the. Judging from the effect of experience on teaching it is recommended to include more residents and surgeons with different levels of experience and to exchange them in different couples.

### Practical implementations for orthopaedic training programs

Organise feedback courses for surgeons with input from residents. Be aware to choose the optimal teams for delivering feedback. As feedback varies in style; match couples more favourable in experience and teaching goals; so select teams of surgeon and resident on levels of experience (in practice and learning, respectively). Further some advice for teaching institutions; be aware of the inherent conflict between running an “efficient” day and making time for teaching. Take measures to ensure teaching is validated in time for teaching.

### Conclusion

Do we practice what we preach? Yes, we do, but we can improve. The operating theatre is a rich and relevant workplace, where residents can practice skills needed for lifelong learning. Supervising orthopaedic surgeons support learning and are skilled at giving technical and procedural feedback. They can engage more in reflective discussions and be more open to receiving feedback. Increasing the autonomy of residents and reducing the power inequality will improve lifelong learning skills. More favourable teams and targeted interventions to address feedback dynamics, power imbalance and time constraints will improve learning.

### Bibliography

1. Mezirow J. “Transformative Learning: Theory to Practice”. *New Directions for Adult and Continuing Education* (1997): 74.
2. Marzo RR. “Role of Medical Education in Cultivating Lifelong Learning Skills for Future Doctors”. *Education in Medicine Journal* 10.3 (2018): 63-66.
3. Lewis M. “Lifelong Learning: Why Professionals Must Have the Desire for and the Capacity to Continue Learning Throughout Life”. *Health Information Management: Journal of Health Information Management Association of Australia* 28.2 (1998): 62-66.
4. Candy PC and Training NBOEEA. “Developing Lifelong Learners Through Undergraduate Education”. 1994: Canberra: Australian Govt. Pub. Service (1994).
5. Matthews C. “Role modelling: how does it influence teaching in Family Medicine?” *Medical Education* 34.6 (2000): 443-448.
6. Jones M and McLean K. “Mindsets for Lifelong Learning, in Personalising Learning in Teacher Education”. Springer: Singapore (2018).
7. LaDonna KA, *et al.* “Staging a performance: learners’ perceptions about direct observation during residency”. *Medical Education* 51.5 (2017): 498-510.
8. Teunissen PW and T Dornan. “The competent novice - Lifelong learning at work”. *Bmj-British Medical Journal* 336.7645 (2008): 667-669.
9. Schut S, *et al.* “Between trust and control: Teachers’ assessment conceptualisations within programmatic assessment”. *Medical Education* 54.6 (2020): 528-537.
10. Sehlbach C, *et al.* “Learning in the workplace: Use of informal feedback cues in doctor-patient communication”. *Medical Education* 54.9 (2020): 811-820.
11. Kenny NP, *et al.* “Role modeling in physicians’ professional formation: reconsidering an essential but untapped educational strategy”. *Academic Medicine* 78.12 (2003): 1203-1210.
12. Wright SM and JA Carrese. “Excellence in role modelling: insight and perspectives from the pros”. *CMAJ* 167.6 (2002): 638-643.

13. Billett SR. "Towards a model of workplace learning: the learning curriculum". *Studies in Continuing Education* 18.1 (1996): 43-58.
14. Glaser B and Strauss A. "Discovery of Grounded Theory". New York: Routledge (1999).
15. Korkiakangas T, *et al.* "Nurse-surgeon object transfer: video analysis of communication and situation awareness in the operating theatre". *International Journal of Nursing Studies* 51.9 (2014): 1195-206.
16. Meredith JO, *et al.* "Are we operating effectively? A lean analysis of operating theatre changeovers". *Operations Management Research* 4.3-4 (2011): 89-98.
17. Blom EM, *et al.* "Analysis of verbal communication during teaching in the operating room and the potentials for surgical training". *Surgical Endoscopy* 21.9 (2007): 1560-1566.
18. Sagasser MH, *et al.* "Self-entrustment: how trainees' self-regulated learning supports participation in the workplace". *Advances in Health Sciences Education* 22.4 (2017): 931-949.
19. Smith AFR and VJ Fortunato. "Factors influencing employee intentions to provide honest upward feedback ratings". *Journal of Business and Psychology* 22.3 (2008): 191-207.
20. Gordon RJ. "Launching Your Career in Medical Education". *NEJM Resident* 360 (2022).
21. Hoffman KG and JF Donaldson. "Contextual tensions of the clinical environment and their influence on teaching and learning". *Medical Education* 38.4 (2004): 448-454.
22. Irby DM and L Wilkerson. "Teaching when time is limited". *BMJ* 336.7640 (2008): 384-387.