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Research Article

Challenges and Deficiencies in Orthopaedic Surgical Training in Germany - A Qualitative Study

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Abstract

Objective

Surgical training is an essential factor for patient safety and care. Germany is in the process of implementing competency-based training. Before changes are made, it is recommended to analyze the current process and its deficiencies to improve a process accordingly. Without analyzing current deficiency, risks for ineffective changes are high. This research aims to reveal the deficiencies in surgical training perceived by stakeholders and the factors leading to insufficient training in Germany to undertake changes of the system accordingly.

Methods

Semi-structured interviews and process mapping was chosen to enable an in-depth exploration and allow unexpected areas to emerge. Trainees, trainers, members of the Federal States - and German Medical Council were identified as key stakeholders. 20 interviews were conducted and analyzed using qualitative content analysis method as well as a PESTEL-Analysis for categorization.

Setting

One-on-one interviews with stakeholders of surgical

training in Germany.

Results

Factors leading to deficiency in training were identified, as a lack of compliance with standards, false logbook entries, insufficient educational resources and unsatisfactory trainer-trainee-relationship. Factors leading to deficiency in training are critical economic and structural issues. Furthermore, political and social factors and a lack of consistent oversights between agencies responsible for curriculum quality were described to affect surgical training persistently.

Conclusion

Orthopaedic surgical training in Germany is facing multiple challenges. Apart from a change of curriculums and logbook, economic, political and structural factors need to be considered and improved to enhance training in Germany.

Keywords: Surgical training; PESTEL-Analysis; Curriculum; Deficiencies in training; Qualitative; Influencing factors

1. Introduction

Surgical training has been identified as the patient safety issue of the next 30 years [1,2]. Training surgeons and adequately supporting them is a key factor in providing the best care possible for the individual patient. The surgeon is a consistent factor in every single surgical patient treated. While many other countries have already implemented competency-based training (CBT), Germany is still in the process of implementing CBT [3]. Data on critics of surgical training 4 and the need for improvement has been increasing [5,6]. Implementation of CBT in Germany is to be achieved solely through a new curriculum and logbook. If one is to improve a system, the first step is understanding its current organizational structure and identifying current quality issues. While few surveys on training have been conducted [7] so far, no qualitative approach has been used to explore areas of deficiencies and perceived reasons for those deficiencies. Compared to quantitative methodologies, semi-structured interviews enable in-depth exploration to uncover individuals' explicit opinions and reasoning [8-10] without the limiting effect of standardized questions and closed responses [9,11]. This research aims to understand in-depth the current structure of surgical training in Germany, using Orthopaedic Surgical Training (OST) as an example, and identify potential areas of deficiencies, need for improvement and factors that affect and hinder the quality of surgical training. The authors conducted this study to reveal the deficiencies perceived in training and quality of surgical training by stakeholders and the factors leading to these deficiencies and insufficient training. The findings will be essential to improve the system of surgical training in Germany accordingly.

2. Methods

This is a cross-sectional qualitative study using individual semi-structured interviews with stakeholders in surgical training in Germany. Ethical approval was obtained from the University of Oxford Medical Sciences Interdivisional Research Ethics Committee (IDREC) (reference R67932/RE001).

2.1 Research team and participants

The interviewer had completed surgical training, as it is recommended that the interviewer is knowledgeable in the field [8]. Participants were key stakeholders in OST in Germany, recruited using a convenience sample method: Trainees, trainers, members of the

Federal States Medical Council (FSMC) and German Medical Council (GMC). The authors recruited participants via email and snowball sampling. Participants worked in 10 different federal states. Trainers and trainees had been working in at least two different hospitals to minimize a single institution bias. The authors performed interviews until no new themes emerged after three consecutive interviews.

2.2 Data collection

Participants engaged in one-on-one semi-structured interviews. The primary researcher transcribed all interviews. The authors established an interview guide to direct the conversations to cover all areas of training in keeping with recommended methodology [12]. No interview was discontinued. Prior to the interviews, the authors created a process map (figure 1) to visualize the process of surgical training. The interviewees then reviewed and revised the process map or highlighting perceived problem areas during the interviews. The primary researcher conducted 20 interviews (10 female, 10 male; average time 57 min, range 25 to 118 min).

2.3 Data analysis

The authors conducted a descriptive and interpretative qualitative data analysis 13, using qualitative content analysis described by Mayring [14]. The authors used a deductive-inductive approach to categorize themes. Coding guidelines were reviewed and revised after 40% of the data was analyzed and again at the status when subcategories were assigned [14]. The authors then analyzed and interpreted the data based on the categories and frequencies. Finally, the authors categorized and coded the data, proving validation communicatively. *Deficiencies in training* matching elements of surgical training [15] analysis were adjusted accordingly. The second emerging theme - *factors leading to insufficient training* - was deductively analyzed based on the PESTEL -analysis [16]. During analysis, the authors adjusted the PESTEL[1] using an inductive categorization approach to better match with emerging themes. They modified *technical* factors into *structural* factors, which were considered more applicable.

3. Results

Results were divided into two parts: First, categories for deficiencies in the training elements were described. Second, factors leading to insufficient training are represented in categories. The categories were then embedded in the process map of the accreditation process for a training curriculum and training as "areas indicating a deficiency in training" and "factors leading to deficiency in training" (figure 2). One category that emerged inductively was strengths in surgical training. Surgical training in Germany was mainly seen as flexible and offering much freedom for trainees. One member of the GMC and two trainers critically appraised changes in the training structure to risk inducing a schooling type of training with less autonomy.

"The whole idea is that you have a mature person in front of you that you don't have to carry through all the teaching steps as you do in school" (trainer).

"Flexibility for trainees in Germany is much higher compared to other countries" (trainer).

[1] Political, Economical, Social, Technical, Environmental, Legal

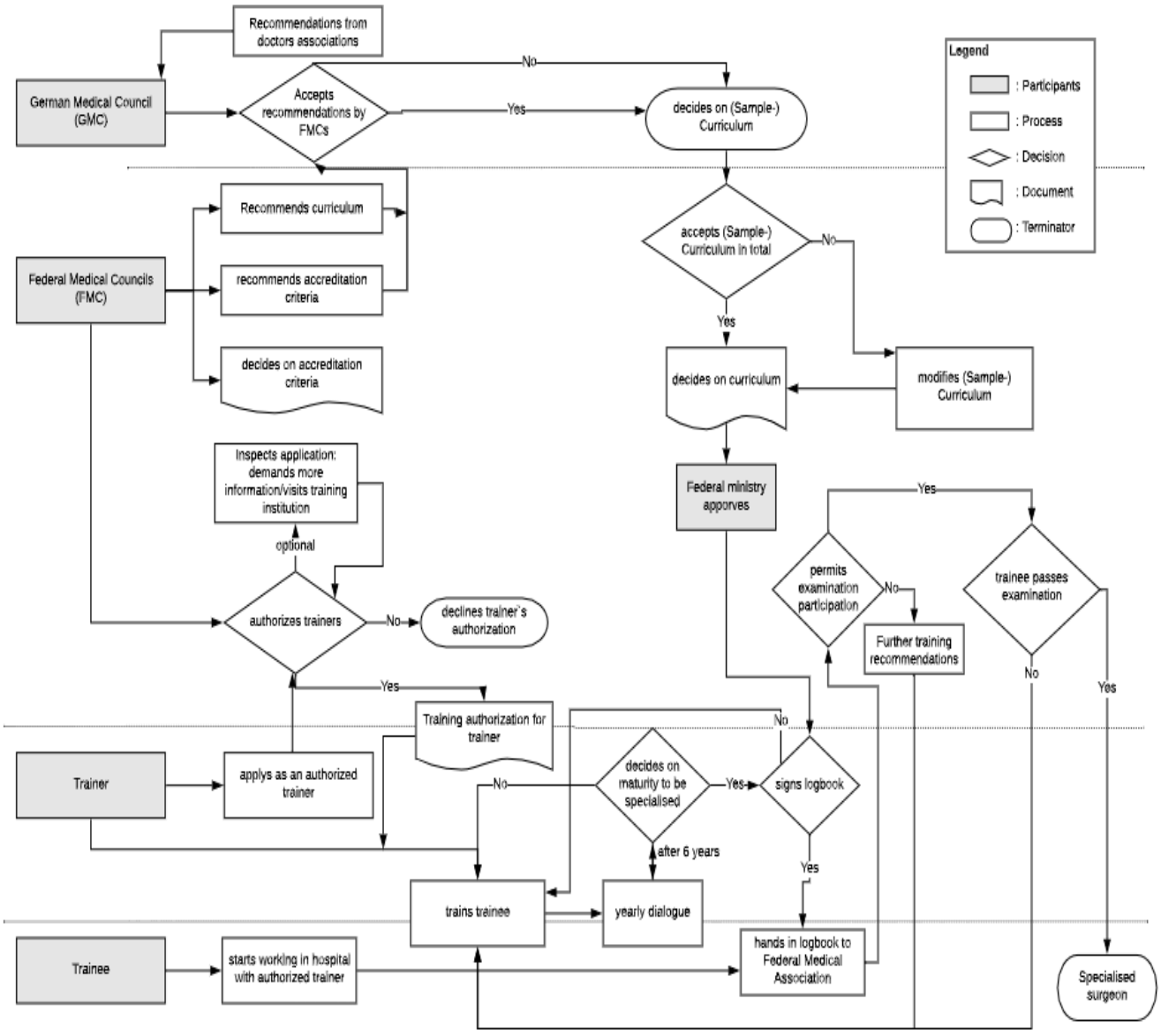

Figure 1: Process map used for semi-structured interviews designed based on the information of the federal and German medical council information. The process map displays the accreditation process for a training curriculum, accreditation of trainers and the training process.

3.1 Deficiencies in the training elements

Areas in which the interviewees perceived the delivered or received training as deficient were grouped in four overall categories (table 1). The authors identified further subcategories in each of these categories and counted the number of participants stating these categories- table one displays at least one anchor example for each category.

Categories and subcategories of areas of deficiencies according to elements of the curriculum	Number of participants stating this (N = 20)	Anchor quotes
Lack of compliance with standards	**20**	
Training is not conducted as mandated by the Medical Council	16	"Neither the logbooks nor the curriculum regulations are carried out as mandatory" (GMC).
		"There is a constant deviation from regulations. The curriculum is just a piece of paper" (trainer).
		"Everyone can do whatever they want" (trainer).
Training not delivered by the accredited trainer	10	"Training is conducted by doctors who are not accredited to training" (trainee).
		"Training is not conducted by the accredited trainer but by doctors lower in the hierarchy. The second-year trainee trains the newcomer "(trainee).
False logbook entries reflecting surgical experience	**19**	
False logbook signatures	19	"…surgical case-numbers are always wrong, they just get signed" (FSMC).
		"Logbooks are signed off without proof provided", (trainee)
Amount and types of surgical procedures/skills unnecessary	10	"The surgical cases in the logbook are too much. Spine or joint replacement surgery should not be a requirement" (trainer).
		"This leads to the fact that we do not have didactic logbook numbers" (GMC).
Insufficient educational resources	**20**	
Time	18	"Time and economization limit the possibility of training" (trainer
No courses	13	"There are no lectures for trainees" (trainee).
No structured knowledge transfer	16	"There must be courses, and for that, there must be money for courses, and for the absence of staff during the time of the course" (GMC).
Unsatisfactory trainer-trainee-relationship	**19**	
Lack of professionalism	9	"The trainee is the weakest element; he is blackmailable in demand for further training. He cannot defend himself against the trainer... ." (trainer).
		"Training still works through personalities: if I like the assistant, he will be trained and promoted. If I do not like him, he will not" (FSMC).
		"The trainer does not have to justify himself before the medical council...the trainee cannot demand training and say "train me better". "There is no control, resulting in helplessness and personal dependency on the trainer" (trainee).
Deficit of feedback	15	"Doctors may find it difficult to criticize colleagues" (trainee).
		"Not receiving any feedback is also unsatisfactory for the trainer" (trainer).

Table 1: Areas that participants mentioned demonstrates deficiencies in training and training quality. The middle column enumerates the number of participants narrating this category. The right column displays the according anchor quotes.

3.1.1 Lack of compliance with standards

The defined standards in the curriculum by the FSMCs were perceived as effectively absent. All trainees identified the accredited trainer as hardly ever being the trainer delivering the training. The interviewees perceived this as a factor of deficiency in training. On the other hand, trainers regarded this as a necessity to enable training based on the hospitals' working conditions.

3.1.2 False in logbook entries reflecting surgical experience: The data showed that the logbook is inaccurate. Every participant but one trainer regarded the number of procedures and necessary skills required as not achieved at the end of training by trainees but signed off to proceed with the final exam.

3.1.3 Insufficient educational resources: There were perceived deficiencies in educational *resources* in training. The fact that no courses are required to fulfil the training requirements were perceived as inducing the change of a fundamental unity knowledge and skills. Unstructured knowledge transfer, without the mandatory offer or participation of structured knowledge transfer and the lack of time for it, were also prominent issues perceived as insufficient educational resources.

3.1.4 Unsatisfactory trainer-trainee-relationship: The *trainer-trainee relationship* was described as an uncontrolled relationship that is dependent on individual "fit" or, to put it in the simplest terms, whether the trainer liked the trainee. This was perceived to lead to a lack of professionalism in the interaction and resulted in a generally flawed feedback culture.

3.2 Factors leading to insufficient training

The second category that emerged was "factors leading to insufficient training". Tables 2-4 displays the categories and subcategories identified, the according numbers of interviewees who mentioned the specific factors and anchor quotations.

3.2.1 Political factors: Physicians' self-governance in Germany was highly valued and appreciated by the participants. Germany's healthcare system provides payment through statutory insurances based on a DRGs (Diagnosis-Related Groups) payment system. Stakeholders perceived the DRGs payment system as a cause for problems in training. Stakeholders tend to have multiple roles, which can become controversial. For example, as part of a political environment (FSMC), they are responsible for the curriculum and training accreditation. However, they are also a hospital employee and thereby held responsible for the hospital's economy. Stakeholders described their multiple roles as leading to deprioritizing of training. By defining the content of the curriculum, the FSMC appeared to justify the right to bill procedures. Decisions about the curriculum were perceived to depend not on the trainees' or society's needs but economic factors. Overregulation through insurance companies' payment requirements was considered responsible for minimizing training opportunities. Trainers and members of the FSMC regarded working hours restrictions as a problem reducing training time, patient contact and surgical exposure for trainees. Trainers identified general doctors' shortages' influence on trainees' motivation as another issue influencing training climate. Knowing that it was easy to find training positions was thought to reduce trainees` motivation. The interviewees described federalism as challenging to create a uniform training system. Otherwise, federalism was described as an advantage as it enables freedom for the Federal States medical decisions. In addition, changes in the training system and curriculum were perceived to take too long. The specialization of hospitals while holding and training trainees for the whole time of their training led to too early specialization and inconsistency with the logbook and training requirements.

3.2.3 Economic factors: Time was considered a key factor to ensure training (table 3). Time was also referred to as a primary financial factor as operating room time is costly. In addition, staff shortages were noted to reduce the opportunities for hands-on training between the trainer and trainee. Economic pressure was found to be implicit within DRGs. The requirement to provide time, staff and financial incentives to train was determined as the responsibility of the training hospital. A lack of financial support for training for hospitals was an additional problem.

3.2.4 Social factors: Training was seen as dependent on working culture and the personal interest of the trainee and the trainer. Trainers and trainees described despair and frustration caused by a lack of appreciation and benefit. Good training was not perceived as valued, neither by prestige nor monetary. Trainers perceived their trainees as their future competitors. The trainees` attitude was described by the trainers as controversial to their past personal training attitude and interpreted as less motivational. The unsatisfactory trainer-trainee-relationship in terms is of deficient feedback-culture is linked to social factors.

3.2.5 Structural issues: Every participant identified the lack of structure in the curriculum and framework as a reason for lacking quality training. The workload of administrative work and the course of surgical activity in the hospital, "training takes place in the afternoon, major surgery in the morning", (trainer) was regarded as a significant competing factor for training by all participants working full-time in a hospital. A lack of interpersonal competencies such as communication, management and patient safety as learning goals in the curriculum was claimed. In addition, trainers mentioned outpatient clinics as not being enough represented in the curriculum.

3.2.6 Environmental factors: Another factor influencing the training was the responsibility felt by surgeons towards patients. Training could be contradictory to the responsibility to provide the best care for the patient. The risk imposed upon patients by inexperienced surgeons was seen as a challenge for training.

3.2.7 Lack of consistent oversights: All participants described insufficient oversight by various parties (FSMC - trainer, FSMC - trainee, and trainer - trainee) over the various levels of the training process as a factor facilitating deficient training. Lack of opportunities and structure for evaluation and feedback between trainers and trainees emerged as a major theme. The missing evaluation was perceived as a leading cause for low quality and missed opportunities for training improvement. Furthermore, the lack of evaluation was promoting dependency of trainees on their trainers' goodwill to train them.

Categories of factors leading to deficiency in training	Number of participants stating this (N = 20)	Anchor quotes
Political factors	**16**	
Training is not adequately prioritized and focused on patients needs	10	"Training does not have a high priority in the hospital routine. Personal development is merely a by-product" (GMC).
		"Training is not seen as a duty of doctors" (trainee).
		"In the FSMC is a divergence in terms of professional policy and professionalism" (FSMC).
		"The current trend in the committees of the GMC is to say that of this; it needs to be ten plate osteosyntheses, three intramedullary nails and so on. I think that this is not good, as it is taking away too much freedom. I have to ask the question, what is best for the patient and what is the current and best status according to the literature" (GMC).
Training curriculum is used as billing instrument	9	"The curriculum is used as a basis for financial reimbursement criteria "Territorial restrictions - who may invoice what - lead to cutbacks in the future training curriculum" (GMC)., (trainer).
Restriction by demands of health insurance companies and certification centres	7	"What you and your trainees are allowed to do often is not determined by the Association of Health Insurances but by social law. The Federal Joint Committee decides requirements that are the conditions for you to be allowed to do procedures. We can't change that. Medical Councils proof from the trainees in their logbook that you have completed these tasks in order for them to do and bill them in future" (GMC).
		"More operations are performed on an outpatient basis. The specialist status applies here. That means it will be even more difficult to get funding for trainees as their work cannot be fully billed for" (GMC).
		"These are sealing-off measures and over-regulation of the market by economization...there is a specialist's obligation in outpatient clinics to receive payment for treatments, which deprives the training possibility for trainees...Certified joint replacement centres have introduced "Main Surgeons" who have to operate often enough to maintain the joint replacement centre. There is over-regulation", (FSMC).
Working hours restrictions	8	"the working hours deviate from the regulations because of the professional medical ethics" (trainee).
		"The content-related expectations for orthopaedic specialists have been the same or have increased, while the time available for training nowadays is just 30 to 40 per cent compared to former times" (FSMC).
Shortage of doctors	9	"With residents being in such high demand, there is no pressure to perform well" (FSMC).
		"There is a lack of knowledge among the trainees...there is an attitude: "I will get a job anyway." If I criticize them, they do not care" (trainer).
		"The reality at the moment is that we have more than more trainees` jobs than trainees accordingly I look for the job where they let them do what I would like to do and just confirm the catalogue anyhow, so I specialize right from the beginning without gaining the required experience", (trainer)
		"In the time of the shortage of doctors, we have the problem that bosses say about untalented surgeons: Leave him here, he will never learn to operate, but it does not matter. The main thing is that he is here" (GMC).
		"Even if management would allow me to have more trainees, there are just no applicants" (trainer).
Federalism	5	"The federal system poses a problem: we want to have a uniform federal education system if possible; if further education is handled very differently, then migration

		between the federal states is significantly more difficult" (GMC).
		"If I start in one state and go to another state during training and the states have different requirements in terms of case numbers, requirements and curriculum, then it becomes difficult for me…" (GMC).
		"What I do not find bad in principle is the goal of defining training and its requirements and that – I would also say – it should be the same nationwide and that you, as a trainer, cannot just sign-off for trainees somehow" (trainer).
Specialization of hospitals	12	"For example, I worked in a joint replacement hospital. Trainees trained there are specialized after doing joint replacements only, which is it "(trainer).
		"My problem with the quality is that in Germany it is possible that someone is in knee surgery only from day 1 to the last day of their training, for six years, and then they are specialists in orthopaedic trauma surgery" (trainer)
Training Curriculum changes take too long	5	"That can be a very long procedure, and the current training curriculum, which we are now implementing at the first of July 2020 in half of the Federal states, began in 2010. In 2010 the order was given to us by the German Doctors' Day to create a training regulation. It took ten years, which is an eternity for an educational system - much too long.
		That is a problem. If one did it centrally with tighter regulations, one would be faster" (GMC).
		"I have to say that the training curriculum and requirements are quite rigid and that it always takes a long time to adapt certain things" (trainer).

Table 2: Political factors leading to a deficiency in training. Categories and subcategories are displayed in the left column. The middle column enumerates the number of participants indicating this category. The right column represents anchor quotes.

Categories of factors leading to deficiency in training	Number of participants stating this (N = 20)	Anchor quotes
Economic factors	**20**	
Profitability of the training hospital	17	"The economization of the health care system and the reduction of the per capita working time creates a deficiency for training. The goal is to provide services as quickly and cost-effectively as possible. that is not possible if I want to teach something step-by-step, which I need to do in surgery" (FSMC).
Time pressure	19	"Due to pressure from the administration regarding time, especially surgery time, I have less and less time to assist surgeries" (trainer).
		"At the same time, we are operating against the clock. The time pressure on surgeries prevents the trainee from learning individual steps" (FSMC).
Financial pressure	18	"I think in the last 15 years under economic pressure and DRG, we have lost many territories" (GMC).
		"Training is very impaired by the targets of the hospitals which are measured in terms of profit only. Based on this, decisions are often made. Meaning I have to do that many operations a day. To create the required number of surgeries per month, you can only do that if you have experienced surgeons who are faster than trainees. You won't be able to achieve the required surgical numbers if you train a lot" (trainer).
Low number of trainees	19	"We have often done it in a way that the trainee does the outpatient clinic with me training her. That is no longer possible. Due to the reduction in staff resources, everyone available has to work by themselves. I no longer have

		the opportunity to train" (trainer).
		"The fact that I need time units for training must also be visible in the staffing, and therefore demands must be made, not only for patient-oriented staffing, which is partly included in the DRGs but also for task-oriented staffing and one task among many others is also training" (GMC).
		"Staffing ratios in hospitals are a huge problem" (trainer).
No financial support for training	12	"Hospital's profits are not invested in staff...much depends on the hospital being the employer. If training is not guaranteed by the employer, there is no chance for the training or the trainer" (trainer).
		"The reimbursement system of German hospitals does not provide for professional development for their staff. This leads to training being even more neglected" (GMC).
		"In the DRG system, training has never been properly represented because all overtime that was worked was never properly documented" (GMC).
		"Training was never further adjusted. In the first DRGs, there was some budget for training. This needs no increase with inflation, which it has not" (GMC).
		"Hospitals are governed by management" (trainer).

Table 3: Economic factors leading to a deficiency in training. Categories and subcategories are displayed in the left column. The middle column enumerates the number of participants indicating this category. The right column represents anchor quotes.

Categories of factors leading to deficiency in training	Number of participants stating this (N = 20)	Anchor quotes
Social factors	**13**	
No advantage through good training for trainers	10	"You want to have something in return...You don't get anything out of training ten specialists, who then just leave" (trainer).
		"Trainers are almost depressed about training because of the situation" (FSMC).
Training of trainees seen as "competition" to trainers	2	"You train your own competitors ... You make yourself redundant" (trainer).
Feedback-culture	8	"Everyone thinks I'm the best trainer. That's the surgeon's arrogance. There is no willingness to acknowledge that training is no good" (FSMC).
		"If I, as a trainer, criticize the trainees, they do not care. The capability to take criticism has decreased dramatically" (trainer).
Trainees attitude	7	"It has become a bit of a different mentality, like if I tell someone at 3:30 p.m.: "Do you want to operate now" you get answers like so "No I have to get my train" or so… that used to be things I had never heard," (trainer).
Structural issues	**20**	
Insufficiently defined learning objectives	12	"The causes of problems and mistakes in training are lack of key subjects" (trainer).
		"There are no standards for training" (FSMC)
Poorly defined standards	11	"There is no explicit curriculum, but that should be the goal. The translation should be taught. Biomechanics should be understood. The trainee should have the ability to understand what they are doing and to

		implement it manually" (FSMC)
		"There are no standards. Every trainer personally sets up a training concept" (trainer).
Training competes with everyday hospital life	17	"In addition to ward work and routine work, training falls short" (trainer).
Insufficient training resources	19	"I think simulation is key and essential in training; without course, training is unacceptable. It makes no sense. No pilot hops in his aeroplane without being in a simulator beforehand. Moreover, that is good" (trainer).
Missing interpersonal competencies in the curriculum	11	"I would adopt "communication", which is particularly important in crises or when you have to deal with a difficult patient or family member" (trainer).
		"interpersonal competence needs to be the third pillar in training. Moreover, that is part of being a doctor- is being a communicator; which also is part of a secure culture... "(trainer).
Outpatient clinic/ non-surgical rotation not compulsory	10	"Curriculum is shaped focused on surgeries and the conservative part of treatments and for example cost calculation is not really discussed" (trainer).
Environmental	**12**	
Logbook requirements in contrast to patient safety	10	"It is not responsible for having a trainee do ten knee replacements, just because you are required to by the logbook" (trainee).
		"As a patient, I would not like to have a trainee who has just completed his third knee arthroplasty, even if the specialist is standing next to him, doing my knee replacement" (GMC).
		"training is exhausting for trainees and trainers. Young trainees are afraid to kill patients" (trainee).
Trainees are self-accountable for adequate training outcome	5	"There is no control, so training depends on the trainee" (trainee).
Legal: Lack of consistent oversights between agencies responsible for curriculum quality	**20**	
Between FSMC and trainer (evaluation and control of training)	13	"we lack statistics and to make training comparable we need in quotation marks objectifiable statistics, which are completely missing in training at the moment" (trainer).
		"The medical association should look a little more at what is really taught and trained in a hospital and focus not so much on theoretical qualifications of the head of the department. That would improve things" (trainer).
		"Politicians want to avoid evaluation. Which district administrator would like to see a review in which his hospital shows that it is the worst place for training. He would have to justify that" (FSMC).
		"Medical councils should look more at what is really taught in a hospital and not so much at what theoretical qualifications ahead of the department has" (trainer).
		"We lack statistics in order to make it comparable; we need some kind of objectifiable statistics. This is completely lacking in surgical training" (trainer).
		"The evaluation process of trainers and trainees does not exist in this respect and is insufficient. It should be mandatory and IT-supported" (FSMC).
Between FSMC and trainee	12	"During training, there is no interim assessment or examination for the trainee, as a review for his development" (trainer).

Between trainer and trainee	17	"There are no contractual regulations between trainees and trainers regarding training. Trainees have no possibility to ensure adequate training" (trainer).
		"Trainees have no legal options to claim, "train me better" (trainee).

Table 4: Social factors, Structural issues, environmental factors and lack of consistent oversights leading to a deficiency in training. Categories and subcategories are displayed in the left column. The middle column enumerates the number of participants indicating this category. The right column represents anchor quotes.

3.3 Process map for the accreditation process

The process map of the accreditation process for the training curriculum and trainers and the training process was adjusted by the emerged categories "areas indicating deficiency in training" and "factors leading to deficiency in training". The areas indicating deficiencies in training (filled red) and the factors causing insufficiency in training (framed in red) are visualized in the process map (figure 2). The adjusted process map displays the high number of non-official and unnoticed factors influencing surgical training in all areas and every level of curriculum development, trainer accreditation and every day surgical training. All boxes framed in red or filled in red represent inductive subcategories which emerged from the data. The process map visualizes the multiple factors influencing day-to-day training in hospitals, e.g. missing financial support, governmental requirements and health insurances. It also displays the impact of personal dependency in der trainer-trainee relationship in a structure with inconsistent oversight of all stakeholders (FMC, trainer, trainee). Furthermore, it points out the critics in the development of a curriculum itself, as it is used as a billing instrument, perceived to lack standards and structured knowledge transfer.

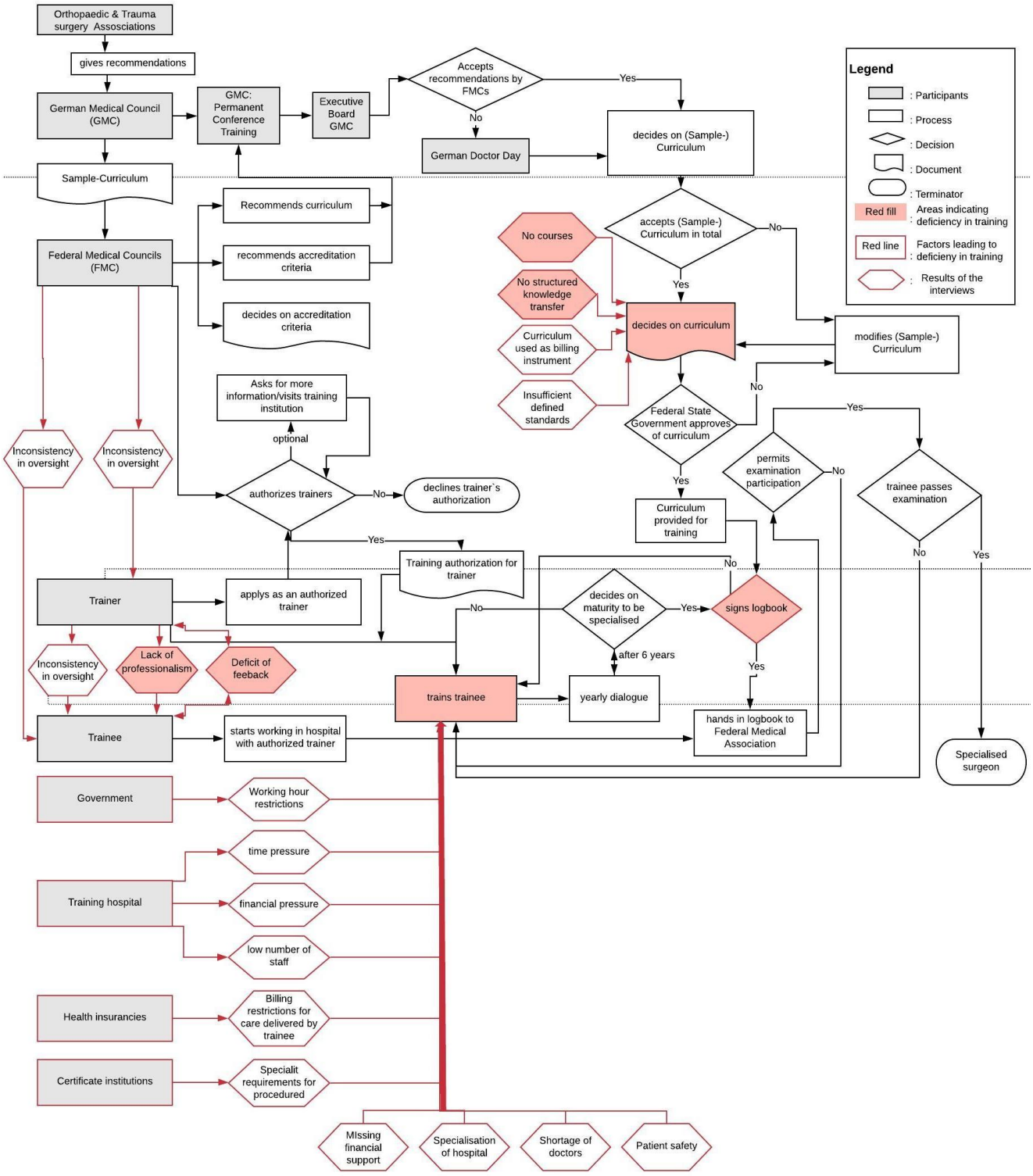

Figure 2: Process map according to the results from the interviews. Red filling showing "areas indication deficiency in training"; red line representing "factors leading to deficiency in training

4. Discussion

Analysis of OST in Germany has revealed fundamental areas of concern and indicated causes. Problematic areas were identified across all elements of a curriculum framework [15], as well as a deficient definition of standards. Failure to comply with these low standards has been revealed through evidence of inaccurate logbook records and unperformed process interviews. While data and reports on curriculum inconsistencies and financial challenges in surgical training in Germany are available [17-19], this study is the first to investigate problem areas and their reasoning from a qualitative approach. Overall, the interviews revealed a major imbalance between power, influence and resources. Hospital management distributes both resources and exercises power, while training responsibility and accountability is singularly dependent on one trainer per hospital. While it is not yet known which factors of surgical training ensure a good patient outcome, studies have shown that the enforcement of a new training program [20,21], training on simulators or debriefing [22-24], and supervision [25,26] improve patient outcomes in specialization training [27]. The data has shown that OST in Germany is likely lacking in all of these points while facing a multitude of other challenges. Surgical training, especially in the operation room, has been proven to increase the time needed for surgery and consequently increase costs significantly [2,28-31]. Surgery time increased by an average of 34% when performed by a trainee 2 and can rise by up to 140% [31]. Farnworth et al. showed an additional $10.61 per minute for the use of the operating room by trainees, solely based on the increase in time. Therefore, surgical training during service delivery is a major matter of the additional expense. Hospitals effectively finance training costs out of profits. However, hospitals are not responsible or held accountable for training as training is accredited to a person (the trainer) and not to the hospital. This misdistribution of possibilities and responsibilities leaves both the accredited trainer and the trainee dependent on the support and financial goodwill of the hospital management. However, this issue might not occur if hospitals had adequate financial resources to invest in surgical training as part of their financial and professional obligations. Hospitals have been under increasing financial pressure [32,33]. Failure to adequately acknowledge training time within the DRGs framework puts the financial burden of surgical training singularly in already constrained hospitals, increasing the risk of reduced training opportunities. Surgical training, thought to be the primary patient safety issue in the following decades [1,2,34], is not recognized through appropriate prioritization or provision of resources. In comparison to other countries Germany shows the least structure and no mandatory course system. The interviewed showed that this leaves trainees dependent on the goodwill of staff to teach and train. In addition Germany has a lower number of surgical cases to fullfil compared to other countries [1]. Falsely signed- off logbooks increase the attention to and question these numbers.

4.1 Limitations and strength

Qualitative interview data depends decisively on the participants view being confounded by the sampling bias of the small number of participants [35]. Secondly, the interview participants were chosen as a convenient sampling and participated voluntarily. Therefore, they are a risk of self-selection and availability bias. This was addressed by including different perspectives and all stakeholders perspectives. However, the decision to interview a

smaller sample size in depth was justified by disclosing areas of deficiencies and the opportunity to explore in-depth the stakeholder's rationale for their views. This approach also identified unexpected areas where quality assurance mechanisms were lacking, which has not been explored before.

5. Conclusions

Orthopaedic surgical training is lacking structure, evaluation and culture. In a time in which health care fights the challenges of economic, time [38-40], and political pressures [41]. Based on these findings, it seems unlikely to improve orthopaedic surgical training through a change of curriculums and logbook content only. Instead, structural, political, economical issues need to be addressed and evaluation cycles installed to create a training culture that ensures high-quality training for orthopaedic surgeons in Germany in the future.

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Author's contribution

Johanna Ludwig- Study design, interviewer, data collection, data analysis, data interpretation, writing

Julia Seifert- Data interpretation, critical revision

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Disclaimers

None

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