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Stopping the haemorrhage of surgical competencies? Assessing the role of compact-interventions in postgraduate General Practice training – a mixed methods study

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Abstract

Objectives: We aimed to assess General Practice trainees' self-perception of surgical competencies and to explore long-term effects of a compact-intervention.

Design: A mixed-methods study was undertaken including a before and after comparison with surveys as well as interviews.

Setting: A two-day voluntary seminar focussing on minor surgery/injuries.

Participants: The first German postgraduate training programme in GP - the KWBW Verbundweiterbildung*plus* (*Competence Centre for Postgraduate Medical Education Baden-Württemberg)* – is designed to ensure GP trainees gain the necessary competencies to master the challenges of primary care. All GP trainees were offered participation in the two-day seminar. GP trainees involved in planning of the study were excluded to participate in the study.

Intervention: Embedded into the full programme and within a two-day seminar, participants experienced 270 minutes of focussed minor surgery/injuries training (=compact intervention).

Results: 326 GP trainees (intervention group=IG: n=257; control group=CG: n=69) participated, of which 30 GP trainees were interviewed (IG: n=17, CG: n=13). GP trainees rated their all-round competency in minor surgery as average on a 5-point-Likert-scale (IG: 3.0±1.0, CG: 3.2±0.9, IG:CG p=.06). As a result of the seminar, participants strongly felt that surgical skills should be a core component of GP vocational training (p=.05). Regardless of previous surgical training, participants valued an interactive teaching concept, practical exercises and peer-to-peer learning. Reflection and discussion of how to implement minor surgery in GP appeared highly beneficial.

Conclusions: A compact intervention covering basic surgical skills provides an 'intense' stimulus to foster positive attitudes towards minor surgery and to promote long-term personal development of related competencies within vocational training. Such factors are crucial in empowering GP trainees to provide high quality comprehensive primary care.

Keywords: Postgraduate medical education, General Practice, Primary Care, Basic surgical skills, Minor Surgery, Compact Intervention

Strenghts and limitations of this study

- This is the first study to explore competencies in basic surgery among GP trainees in Germany.
- By a mixed-methods design, the study is designed to explore the long-term effects of an educational compact intervention within a neglected field of training.
- We recognise that participation was voluntary and a validated assessment of competencies could not be performed.

1. Introduction

Primary healthcare, including General Practice (GP), aims to provide comprehensive, efficient and effective healthcare to everyone, everywhere (1). GP incorporates specific problem-solving skills as well as dealing with acute health problems such as injuries (2). To fulfil these tasks, General Practitioners (GPs) require specific competencies, including in "minor surgery". Competencies in medical education can be summarised as the *"knowledge, skills and attitudes required for the desired performance and behaviour"* (3). Minor surgery is defined as "*an operation on the superficial structures of the body or manipulative procedure that does not involve a serious risk"* (4). While identified as a necessary competency in GP, concerns of insufficient GP training in minor surgery are long standing (5) and persistent (6,7,8,9), particularly in countries without a robust primary care system (10,11). For Germany, there are also variations in provision of minor surgery with regard to the physician's individual s training and setting of the practice (urban/rural) (12,13).

Due to the wide breadth and specific requirements of GP, training programme directors have to decide on limits within the training curriculum. This is particularly pertinent for countries without a structured pedagogic programme, where vocational 'on the job' commitments restrict time for supplementary self-directed learning outside of clinical practice (14). However, even

where GP training is clearly structured, such as in the UK, training in surgery is not a necessary component of the three-year training for GP (15).

In Germany, GP speciality training requires five years of postgraduate training, with mandatory rotations in internal medicine (12 months) and GP (24 months), in addition to 24 months of further training in other elective specialist rotations. Rotations in surgery are not mandatory. The first German postgraduate training programme in GP - the KWBW Verbundweiterbildung*plus* - aims to ensure basic competencies to help GP trainees master the challenges of primary care, including within rural areas. Since 2008, it offers a curriculum, seminar-programme, a structured mentoring-programme and regional clinical rotations across Baden-Württemberg as well as 'train-the-trainer' courses for educators (16,17).

GP trainees' attitudes towards and competency requirements for minor surgery have received little attention. This includes how basic surgical competencies could be ensured in a context of non-mandatory surgical rotations and limited annual time for a complementary programme during vocational training. Educational compact interventions have shown to be feasible, effective and time-efficient means of fostering competencies of GP trainees in the mid-term (18,19). Aims of this study were:

(1) to evaluate self-assessed competencies in basic surgery among GP trainees,

(2) to explore the effects of an educational compact intervention within a neglected clinical area,

(3) and to describe the long-term impact of the compact intervention.

2. Materials and Methods

2.1 Study design

The study examined GP trainees' confidence in basic surgical competencies before and after a structured surgical skills seminar through a pre- and post-intervention participant survey and post-intervention participant and non-participant interviews.

2.2 Setting

All GP trainees registered on the KWBW Verbundweiterbildung^{plus} were invited to participate in a two-day voluntary seminar focussing on minor surgery/injuries. A total of 13 seminars were offered between January and December 2019. The seminars took place in seven different venues in Baden-Wuerttemberg, Germany. Participating GP trainees were invited to take part in the study (=intervention group, IG). Non-participating GP trainees (=non-attendees) were invited to the control group by email after the intervention period (=control group, CG).

2.3 Ethics

The study was embedded into a larger cohort study and approved by the Ethics Committee of the University of Heidelberg (S570/2015). Participation in the study was voluntary and not incentivised. All participants provided signed informed consent.

2.4 Patient and Public Involvement

In this study, involvement of patients was not applicable. In 2018, public was not involved in planning of the study.

2.4 Intervention

An educational compact intervention on minor surgery/injuries was developed. In 2019, this compact intervention was integrated into the annual two-day training programme of the KWBW Verbundweiterbildung*plus*. The target number of participants was n=25 GP trainees per course. The main educational objective was to ensure participants gained the knowledge and skills required to treat patients presenting to GP with minor injuries. This included updating any previous surgical competencies. The hidden curriculum aimed to increase participants' self-esteem and to establish a personal self-affirmation towards surgery. The course blueprint is presented as a supplementary file (Supplement 1).

2.5 Data collection

Participants of the intervention were asked to complete a paper-based questionnaire directly before (T1) and an online survey twelve weeks after the seminar (T2). Non-attendees were invited by email to take part in a single online survey in March 2020 (T3). Attendees as well as non-attendees, including both GP trainees with as well as without a 6-month rotation in surgery, were recruited to interview after the intervention period. Data collection was completed in July 2020. Those GP trainees with previous training and certification in a surgical speciality were excluded.

2.6 Measures and Outcomes (questionnaires)

Questionnaires developed by the study authors drawing on a comprehensive literature analysis, the Association for Medical Education in Europe (AMEE) guide 87 (20) and personal experience of medical training interventions were used (18,19) to assess study outcomes. Participants rated 29 competencies in surgery using a five-point-Likert-scale. Additional questions were added to the survey at T2 and for non-participants taking into consideration the different times of data collection and needs of the target groups. All three versions of the questionnaire were piloted using a think-aloud technique with GP's and GP trainees before use.

2.7 Interviews

Interviews were performed as semi-structured telephone interviews solely by a trained researcher with audio recording (SSte, MD, GP). The manual was developed in a team (n=4), whose members were familiar with the programme, the needs of the target learner-group and the current literature. The manual was piloted using think-aloud technique with two graduates from the programme with minor revisions before use. Main themes covered retrospective consideration of the intervention (including emotions) and its impact on the interviewee's current competencies in minor surgery.

2.8 Data analysis

2.8.1 Questionnaires

All quantitative data were analysed using the statistical program SPSS (IBM Statistics, Version 25). Characteristics of GP trainees were summarised using descriptive statistics (absolute and relative frequencies (categorical variables), mean with standard deviation, and median with interquartile range (continuous variables)). Chi-square tests were used to detect differences in frequencies between the groups and t-tests for differences in rank and continuous variables. Differences between T1 and T2 were analysed using t-tests for dependent samples and McNemar-tests.

2.8.2 Interviews

Interviews were transcribed verbatim (German). Data was analysed by three different researchers using the structured qualitative content-analysis approach of Kuckartz (21) and with the aid of MAX-QDA (VERBI GmbH, Berlin, Germany). All quotations in the manuscript were forward translated, with critical review and revision by a native English speaker fluent in German (AP; researcher in GP). A COREQ-List is provided in the supplements (supplement 2).

3. Results

All GP trainees registered in the KWBW Verbundweiterbildung*plus* in January 2019 (n=434) were invited for participation. Of these, 379 (87.3%) participated in the training programme (=active). The largest single reason for non-participation was a period of parental leave. N=281 of active GP trainees participated in 13 independent interventions (mean n=21, range 15-31). GP trainees in the study team were excluded from participation (n=3). The response rate for pre-intervention questionnaires at T1 was high (88%, n=257/278), decreasing for post-intervention questionnaires at T2 (response rate 53% n=135/257). Of 156 GP trainees invited to the control group, just under half participated (response rate 45.1%, n=69/153, or 70.4% excluding those discontinuing the programme, n=69/98). In total, 326 GP trainees (IG: n=257, CG: n=69) participated in the study.

A total of 30 interviews were completed 9 months post-intervention. Mean interview duration was 27 minutes 54 seconds. (Minimum 14 minutes 9 seconds, Maximum 38 minutes 26 seconds). In the IG (n=17), 9 attendees had previous surgical experience (=rotation) compared with 8 who had not. In the non-attendees' group, 13 GP trainees participated in the interviews of which 6 had previous surgical experience (=rotation) compared with 7 who had not.

3.1 Sociodemographic data

Sociodemographic data for the IG and CG are presented in Table 1. 18.3% of IG (n=47) and 17.3% of CG (n=12) were older than 40 years. On average, the IG were in the fourth and CG in the fifth year of training (T1:CG, $p<0.01$). 34% of IG (n=89) and 49% of CG (n=34) had previously undertaken a rotation in surgery ($p=0.03$). Of those participating in the interviews, median age was 34.5 yrs. (Q1:33, Q3:35.75) and 73% were female (n=22, n=8 male). Mean duration of GP training was 3.8 yrs. (SD=0.83).

Table 1

Sociodemographic data and prior surgical experience of GP trainees (n=326)

		IG T1 (n=257)	IG T2 (n=135)	CG (n=69)	T1:CG (p)
Gender (n, %)	Female	187 (72.8%)	82 (60.7%)	57 (82.6%)	.08[1]
	Male	62 (24.1%)	18 (13.3%)	10 (14.5%)	
	Unknown	8 (3.1%)	35 (25.9%)	2 (2.9%)	
Age (in years)	**Md (Q1; Q3)**	**35 (32; 39)**	**34 (32; 39)**	**36 (34; 38)**	.08[2]
	Min-Max	27-62	27-60	28-52	
Year of training	Md (Q1; Q3)	4 (3; 5)	4 (3; 5)	5 (4; 5)	**<.01[2]**
	Min-Max	1-5	1-5	3-5	
Current rotation (n, %)	Outpatient / community or GP	204 (79.4%)	81 (60.0%)	61 (88.4%)	.12[1]
	Hospital	41 (16.0%)	17 (12.6%)	6 (8.7%)	
	Unknown	12 (4.7%)	37 (27.4%)	2 (2.9%)	
Are you currently undertaking or have completed a rotation in a surgical speciality?		Y 89 (34.6) N 163 (63.4) Unknown 5 (1.9)	Y 36 (26.7%) N 60 (44.4%) Unknown 39 (28.9%)	Y 34 (49.3) N 34 (49.3) Unknown 1 (1.4)	**.03[1]**
Have you gained surgical competencies outside of medical or postgraduate medical education (e.g., training as paramedic)?		Y 67 (26.1) N 175 (68.1) Unknown 15 (5.8)	Y 29 (21.5%) N 68 (50.4%) Unknown 38 (28.1%)	Y 15 (21.7) N 53 (76.8) Unknown 1 (1.4)	.35[1]

Note. GP=General Practice, T1: before intervention, T2: 12 weeks after intervention, IG= intervention group, CG=control group, p: p-value M: Mean, SD: Standard Deviation, Md: Median, Q1,Q3: interquartile range, [1]: chi-square (without "unknown" category), [2]: Mann-Whitney-U-Test

3.2 Self-assessed competencies (survey)

Table 2 depicts self-perceived competencies of GP trainees, with comparison of attendees (IG) and non-attendees (CG). GP trainees rated their all-round competency in the management of conditions requiring minor surgery within GP as average on a 5-point-Likert scale (maximum of 5) (IG at T1: 3.0±1.0, CG at T3: 3.2±0.9, IG:CG p=.06) [How do you estimate your all-round competencies in the treatment of surgical clinical pictures in General Practice? (M±SD)].

Table 2

Tab.2 - Self-assessment of competencies in basic surgery of General Practice trainees (n=326)

	IG T1 (n=257)	CG (n=69)	IG T1:CG (p)
How competent do you feel at examining traumatic injury affecting the following parts of the body? (M, SD)			
Shoulder joint	3.1 (1.0) n=256	3.0 (0.9)	.40
Elbow joint	2.9 (1.0) n=256	2.9 (1.1)	.66
Wrist joint	3.1 (1.0) n=256	3.1 (1.0)	.93
Finger joints	3.3 (1.0) n=256	3.3 (1.0)	.98
Hip joint	3.4 (0.9) n=256	3.2 (1.0)	.11
Knee joint	3.5 (0.9) n=256	3.4 (1.0)	.35
Ankle joint	3.2 (1.0) n=256	3.2 (1.0)	.80
Cervical spine	3.0 (0.9) n=255	2.7 (1.1)	**.03**
Thoracic spine	3.1 (0.9) n=255	2.8 (1.0)	.01
Lumbar spine	3.2 (0.9) n=254	3.1 (1.0)	.22
Rate your competencies in… (M, SD)			
Assessment of wounds	3.5 (0.9)	3.8 (0.8) n=68	**.02**
Treatment of acute wounds	3.4 (1.0) n=255	3.7 (0.9) n=68	.10
Treatment of chronic wounds	3.0 (1.0)	3.3 (1.0) n=68	**<.01**
Treatment of infected wounds	2.9 (1.0) n=255	3.3 (1.0) n=68	**<.01**
Postoperative care of fractures	3.2 (1.1) n=255	3.3 (1.0) n=68	.55
General documentation of injuries	3.2 (1.0) n=256	3.5 (0.9) n=68	.07
Assessment of vaccination need after injuries	4.0 (0.9)	4.2 (0.8) n=68	.06
Knowledge of specific features of occupational injuries	2.9 (1.1) n=255	2.9 (1.2) n=68	.68
Instigating supports/splints and rehabilitation	2.7 (1.0)	2.8 (1.0) n=68	.41
Organisation of supportive care in the community	2.8 (1.0) n=254	2.8 (1.0) n=68	.80
How competent do you feel at initiating treatment in the following clinical presentations? (M, SD)			
Contusion	3.8 (0.9)	4.2 (0.8) n=68	**<.01**
Sprain	3.5 (1.1)	3.6 (1.1) n=68	.55
Luxation	2.7 (1.1)	2.5 (1.1) n=68	.32
Bite wounds	3.1 (1.1) n=256	3.3 (1.1) n=68	.10
Foreign bodies wounds	3.0 (1.0) n=254	3.1 (1.1) n=68	.60
Burns	3.0 (1.0)	3.1 (1.0) n=68	.47
Fracture	3.1 (1.0) n=256	3.0 (1.1) n=68	.58
Head and neck injury/trauma	3.0 (1.1) n=256	2.9 (1.1) n=68	.39
Domestic violence related injuries	2.6 (1.0) n=256	2.4 (1.1) n=68	.23

Note. GP: General Practice, T1: before intervention, T2: 10 weeks after intervention, IG= intervention group, CG=control group, p: p-value, M: Mean, SD: Standard Deviation, t-test, Likert scale (1-5, max.=5)

After the training intervention, the IG rated their all-round competencies at 3.1±1.0 on a 5-point-Likert scale (T1 at T2: p=.43). At T1, CG self-rated their competencies significantly better than IG, predominantly in the assessment and treatment of wounds. Despite teaching on tetanus prevention, both groups rated their competency as average.

3.3 Effects of the intervention (survey)

GP trainees' responses on the effects of the compact-intervention in basic surgery are displayed in Table 3. The intervention led to a significant increase in the number of GP trainees feeling a surgical rotation should be a mandatory component of GP vocational training (p=.05).

Table 3

Tab. 3 – Effects of a compact-intervention in basic surgery for GP trainees (n=326)

	IG T1 (n=257)	IG T2 (n=135)	CG (n=69)	IG T1: CG (p)	IG T1:T2 (p), n=100
How reasonable do you consider the following to be…					
A rotation in a surgical specialty during GP vocational training? (M, SD)	4.4 (0.8) n=256	4.4 (0.8)	4.2 (1.1)	.16	.68
A **mandatory** rotation in surgery during GP vocational training? (M, SD)	3.1 (1.3) n=256	3.3 (1.3)	3.9 (1.1)	**<.01**	**.05**
How would you rate your interest…?					
In surgery (in general)? (M, SD)	3.9 (0.9) n=255	3.9 (1.0)	3.7 (1.0)	.11	.30
In surgical presentations within General Practice ("minor surgery") (MD, SD)	4.1 (0.9) n=255	3.8 (1.1)	4.1 (1.1)	.97	**<.01**
In a GP-Practice rotation during vocational training which regularly offers "minor surgery"? (M, SD)	4.1 (1.0) n=256	4.1 (1.1)	4.4 (0.9)	**.03**	.09
In personally performing "minor surgery" in your future practice? (M, SD)	3.8 (1.2) n=255	3.7 (1.3)	4.1 (1.1)	**.03**	.57
As a result of the intervention, how highly would you rate your agreement with the following statements:					
I feel more confident in the treatment of patients with injuries.	n/a	3.2 (1.0)	n/a	n/a	n/a
I feel more competent in the treatment of patients with injuries.	n/a	3.1 (0.9)	n/a	n/a	n/a
I require direction from my GP-trainer on patients with injuries less often.	n/a	2.8 (1.0)	n/a	n/a	n/a
My interest in treating patients with injuries in GP has increased.	n/a	3.2 (1.1)	n/a	n/a	n/a

Note. GP: General Practice, T1: before intervention, T2: 10 weeks after intervention, IG= intervention group, CG=control group, p: p-value, M: Mean, SD: Standard Deviation, t-test, Likert scale: 1: very bad to 5: very good

3.4 Expectations and effects of the intervention (interviews)

Participant expectations are summarised in Table 4. Both groups felt the compact intervention was relevant to routine GP. Participants expected the intervention to provide practice-oriented knowledge and skills, including structured procedures/algorithms on management within GP and when to refer to secondary care. Long-term, post-intervention codes were categorised into six categories (Table 5): part I summarizes *strengths of the intervention - general*, *strengths – peer to peer* and *weaknesses*; part II presents further categories (*content remembered, conclusion and impact on attitude and behaviour*).

Table 4

Tab. 4 – Expectations of GP trainees on a compact-intervention in basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Rating	No expectations	No expectations Low level of confidence in the topic. Promising title
Assessment of relevance	Relevant theme Common reason for GP consultation	Relevant for consultation in GP Relevant for personal training Challenge to implement surgery in GP
Exceptions with regards to content	Desire for structured procedural guidance and identification of red flags Desire for support in undertaking procedures independently Theoretical background / knowledge Wound dressing Wound management such as suturing or glue application Vaccination Postoperative organisation Postoperative analgesia	Desire for structured procedural guidance / algorithm Desire for support in undertaking procedures independently Desire for competencies Wound dressing

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, qualitative content-analysis in regard to Kuckartz (21)

Participants with and without previous surgical experience rated the mixed learning groups highly, feeling they helped to establish a positive peer-learning atmosphere.

> ***#18 (no rotation in surgery):*** *"Well, I liked it. Especially as a beginner, it was good to realise that the others haven't mastered everything; that there were colleagues who have worked for several years yet haven't done many surgical procedures."*
>
> ***#20 (2 yrs. in surgery):*** *"Well, I was really excited by the topic. Even though I didn't learn much new knowledge, the topic itself, while partly a repetition, got to the point on how it (minor surgery) could be and really is practiced in GP."*
>
> ***#30 (6 mo. in surgery):*** *"Well I was heavily involved in surgery at that time and that is why it was a little redundant for me (...) it was enjoyable to do the exchange with those who have not done surgery in years, perhaps last time during medical school, and others who had more experience than me. To apply basic principles to GP was really good then."*

Participants were motivated to develop their surgical competencies, even if they previously had a negative attitude towards surgery:

> ***#18 (no rotation in surgery):*** *"Yes, so it has shown me that basic surgical skills are really important for general practice. To be honest, I didn't really like surgery during medical school, but I did have a positive experience in the final year (of medical school), and this seminar has strengthened that (position), that it is really cool if you are able to do such things in the general practice by yourself, yes, certain things on your own. That was my impression, that I would absolutely want to reinforce*."

Table 5 (part I)

Tab. 5 part I – Long-term evaluation of a compact-intervention on basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Strengths of the intervention - general	Alignment with the competence-based curriculum in General Practice	Case-based learning
	Gain in knowledge in comparison with the previous rotation (burns injuries)	Beneficial despite low level of personal competence in the topic
		Increased participants‘ self-esteem
	Refresher	Focus on application in GP
	Procedural guidance (out-/in-patient). What can I do on my own / when do I admit to hospital?	Real-life cases from day-to-day GP
	Practical exercises – bandaging	Practical exercises – Oberst‘ conductive anaesthesia Practical exercises – physical examination of joints Suture practice Splinting after suspected fracture
	Educational methods – picture quiz	Educational methods – picture quiz Educational methods – group work
	Teaching aids – bandaging	Teaching aids – wound dressing
	Focus on application – how to perform minor surgery in practice	Interactive learning
		Comprehensive approach – post-fall injuries presenting alongside musculoskeletal trauma e.g. abdominal injury
		Lecturers (experienced GPs)
		Encouragement and increased self-confidence
Strengths of the intervention – peer to peer	Interactive learning and exchange with peers	Learning from peers Realisation of different levels of competence (motivating)
	To reflect on various management approaches	Collective learning enabled group work
	Exchange of experiences	Realisation of learning/competency gaps (due to comparison)
		Heterogeneity is beneficial
Weaknesses of the intervention	Reduced learning success without experience in GP practice	Reduced learning success without experience in GP practice Excessive pressures if in first year of training
	Skills redundant given previous surgical rotation	Too few practical exercises
	Skills in suture not necessary	Not enough training in suturing
	Not enough teaching on wound dressing	Not enough group works
	One lecturer expanded on emergency medicine too much (not relevant for GP)	Chronic wounds not part of the intervention

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, qualitative content-analysis in regard to Kuckartz (21)

Furthermore, participants were motivated to improve their gaps in surgical competencies by addressing the issue, particularly through learning from peers. The intervention was a challenging but positive experience on the GP trainees' competencies.

> ***#34 (no rotation in surgery):*** *"Yes, I had a bad feeling about wound management, I didn't know where to start. I recognised I really had to do something about this. That was what it provoked, it wasn't really a bad feeling in the end, but more that it was „good to have been confronted with that", that I have reflected on that, that I have to deal with minor surgery in GP, that I have to improve for my patients."*

> ***#6 (no rotation in surgery):*** *"Well, I asked the medical staff (at my practice) and my trainer if I could be involved with the management of wounds, so that I just can see it. Yes, sometimes it works well and sometimes less so, because I also have consultations (with my own patients), but I felt that, ok somehow I have somehow to gain greater experience and therefore also to organise (learning) situations, to at least have tried doing it.*

One beneficial aspect of the intervention was participant reflection and discussion on how minor surgery could be offered in routine GP. This included areas where it was seen as more (outside of cities) and less applicable (in urban areas with many surgeons and hospitals).

> ***#28 (6 mo. in surgery):*** *"Yes actually what is possible in GP (...) I think the lecturer mentioned that treatment of wounds in GP is becoming less frequent because it is not adequately financially reimbursed, and that you have to provide sterile materials and such things. But nevertheless, that he has shown what you can offer without having the arsenal of an emergency department to hand, which care you could provide. Yes, I really liked that, it gave me a realistic picture of what to expect in practice."*

Table 5 (part II)

Tab. 5 part II – Long-term evaluation of a compact-intervention on basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Content remembered	Reflection and exchange on which level of minor surgery can be offered in General Practice	Many practical exercises / skills
	Practical exercises – suturing	Practice exercises – suturing
	Practice exercises – bandaging	Practical exercises – bandaging (compression bandage, Finger bandaging)
	Practical exercises – splinting	Practical exercises – physical examination of joints
	Picture quiz	Picture quiz
	Wound dressing	Wound management procedures in GP
	A challenge after 1 year	Burns injuries, ‚rule of palm‘
Conclusion	Very helpful for General Practice!	Very good and practice-oriented
	Very informative!	Good and informative!
	Outstanding!	Content way better than expected from the title
	Convenient	Very relevant
	I liked it	Group work - enabled getting to know colleagues
	Slightly boring	Stimulus to meet learning/competency needs
	Exchange of different opinions	Rapid overview
	Exciting despite some overlapping with previous surgical rotation	I can‘t remember
	Inspiration for GP (boost in motivation)	Now I can benefit from it
Impact on attitude and behaviour	Realisation that minor surgery by General Practitioners is mostly offered in “rural” areas	Intense stimulus to meet learning/competency gaps (during GP rotation)
		Established ways to develop competency (e.g. see as many patients with wounds as possible)
	Wish to offer minor surgery	Stimulus to apply for a rotation in surgical training (despite reservations against surgery)
	Regret that minor surgery in GP is only possible at a limited level	Work shadowing in surgery
		Rotation in surgery training
		Minor surgery in General Practice could be learned in rural GP Practices
		Realisation of learning/competency gaps (due to comparison with others) and realistic self-perception
		Approval of relevance of minor surgery in GP
		Increased wish to gain competencies in surgery
		Increasing wish to offer minor surgery in GP
		Wish for further future courses
		Frequent use of finger bandaging

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, qualitative content-analysis in regard to Kuckartz (21)

3.5 Non-attendees (interviews)

Non-attendees were asked why they did not participate in the compact intervention, what could have enabled successful participation and what they had expected of the intervention. There were no differences in responses between those with and those without surgical experience. Reasons for non-attendance were: insufficient support from employers (no time for participation, no financial support), incompatibility of an over-night stay with family duties, not being in Germany at the time of intervention, and acute sickness. Release and financial aid by the employer as well as the offer to participate in the intervention in a one-day format or child-care would have supported participation. The non-attendees rated the intervention theme as both relevant and frequently utilisable within GP. Those unable to participate due to acute sickness expressed regret at non-attendance, due to the perceived value of the topic, the collegial and positive atmosphere and the chance for peer-learning.

4. Discussion

To the best of our knowledge this is the first study to assess subjective competencies in basic surgical skills among GP trainees in Germany. Due to the comparably high number of participants, the study also represents a valuable addition to existing international studies. The current study has identified that GP trainees in Germany perceive their competency in minor surgery and wound management to be 'average'. As a result of the intervention and increased self-awareness of knowledge gaps, learners favoured a mandatory training rotation in surgery. The mixed learning groups, practice-oriented interactive educational approach and ability to compare experiences with others influenced its success. In sum, the intervention increased GP trainees' motivation to address competency-gaps in the long term and intensified understanding of as well as willingness to provide minor surgery in future practice.

The compact intervention promoted GP trainees' competency development in the long term. This is remarkable given its brevity. Compact interventions have previously been demonstrated to foster knowledge gains, skill acquisition, attitudinal and behaviour change in GP trainees in the short and intermediate term (18,19, 22). The effective compact intervention of the present study included experienced GPs as lecturers, an interactive learner-oriented educational approach, a positive learning atmosphere, case-based scenarios and integration of the learner's daily life (practical approach). The study was designed to explore the long-term changes after a compact-intervention. It showed that GP trainees attitudes towards surgery had improved and that they had started to address gaps in surgical competencies. This goes hand in hand with the learning-theory of Sagasser et al. (23), who postulated a short-time and long-time learning loop of GP trainees. The current compact intervention positively stimulated GP trainees' self-directed learning. This was likely achieved through creation of a positive attitude, goal setting and motivational encouragement to utilise competencies in practice. Boosting motivation appeared highly correlated with a positive learning atmosphere and re-affirmation of previous competencies. Motivation could be described as prerequisite for learning in general (24). This

study identified another effect of compact interventions: The peer-to-peer learning in a mixed learner's group turned out to be beneficial for two reasons: 1) participants intensified their learning by the peers' perspectives or being an instructor themselves, and 2) by comparing themselves with peers (comparison): '*If a peer can handle minor surgery in GP, I can also master it!*'. Peer-to-peer learning emblematised that performance of minor surgery in GP is both feasible and necessary. To note, direct competition is ambiguous, as it negatively influences (long-term) memory within learning processes (25).

Secondly, the study identified low self-esteem and perceived insufficient training in minor surgery amongst current GP trainees in Germany. Early exposure to surgical skills supports medical students to establish a competency foundation which can be developed further during residency training (26). Nevertheless, continuity in training is valuable (7) and surgical skills form one component of broad primary care, a necessity in rural areas (13).

Thirdly, the compact intervention significantly changed the GP trainee's attitudes towards a mandatory surgical rotation during GP speciality training even among those, who self-reported adverse attitudes towards surgery in general. Compact interventions have previously shown to affect participants' attitudes (18). However, if GP trainees feel forced competency development could expected to be only small. The sequence of learning could be the following: Firstly, self-awareness of competency gaps in minor surgery but accompanied with skills and motivation to deal with them (=compact intervention in minor surgery, preferable in the first year of training). Then secondly, seeking for learning environments either in a surgical department, surgical practice or general practice. As such, GP trainees should ideally seek out practices which offer minor surgery.

Limitations

To our knowledge, this is the first study to explore self-assessed competencies in basic surgery among GP trainees in Germany, as well as to longitudinally evaluate a compact intervention in minor surgery/injuries. We recognise that: firstly, participation was voluntary, meaning randomisation was not applicable and selection bias cannot be ruled out. Voluntary participation meant that dropout occurred between T1 and T2. Secondly, the extent to which other external factors may have influenced trainees' competency development after the intervention, including knowledge and skills in practice, is unclear. As such, quantifying the effects of the intervention must be seen within a wider training and development context. Thirdly, validated assessment of competencies (written and/or oral and/or practical such as directly observed procedures) could not be implemented. Fourthly, the intervention was performed face-to-face in 2019. Further research would be required to identify whether findings can be replicated using virtual training methods, for example online. Finally, GP trainees undertaking the KWBW Verbundweiterbildung*plus* training programme may have known each other prior to study commencement. This prior cohesiveness may have influenced the learning atmosphere and thereby fostered a gain in competencies (27).

Conclusion

A compact intervention in minor surgery as presented could help prevent the haemorrhage of surgical competencies in primary care, both in Germany and on an international level. It fosters competencies in the long term and induces changes in behaviour as well as learning, thereby potentially empowering the GP workforce to provide broad primary care. Further research is necessary to explore which organisational and reimbursement structures are required to ensure training of GP trainees and educators in minor surgery is sustainable and whether this translates in effective long-term care provision.

Declarations

Competing interests

SSwl, DR, JSz and SSte were involved in the organisation of the training program KWBW Verbundweiterbildung*plus*. All authors declare no further competing interests.

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Abbreviation

CG	Control Group
GP	General Practice
GPs	General Practitioners
KWBW	*Kompetenzzentrum Weiterbildung Baden-Württemberg*
Verbundweiterbildung*plus*	(GERMAN) = Competence Centre for Postgraduate Medical Education Baden-Württemberg (Registered ®, German patent office, Munich, Germany)
IG	Intervention Group

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Author's contribution

SSwl contributed to conception and design of the study, to acquisition, analysis and interpretation of data and to drafting and revising the manuscript. KK contributed to design of the study, to analysis and interpretation of data and to revising the manuscript. AP contributed to analysis and interpretation of data and to drafting and revising the manuscript. DR contributed to acquisition and analysis of data and revising the manuscript. JSe contributed to interpretation of data and to revising the manuscript. JSz contributed to interpretation of data and to revising the manuscript. SSte contributed to design of the study, to acquisition, to analysis and to the interpretation of data and to drafting and revising the manuscript. All authors read and approved the final manuscript.

Data sharing statement

Data is available from the corresponding author (SSwl) at reasonable request. The original dataset is in German.

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Figure 1

Blueprint: A compact intervention for General Practice Trainees aiming at the improvement of competencies in minor surgery				
Schedule	**Step**	**Aim**	**Methods**	**Tools and material**
Pre-interventional survey				
90 min.	**Minor surgery in General Practice – part 1** **"I have fallen down the stairs / I have cut myself"**	Introduction, reflection on personal level of competence Knowledge and how to do it: common algorithms on how to proceed with different consultations in general practice (e.g. fall, contusion, fracture, acute wounds, bites, foreign bodies), red flags as well as watchful waiting	Group discussion on previous knowledge and experience, lecture, case-based plenary discussions, group-work on cases	Survey on previous skills, presentation, chart request, print-out of cases /work sheets
30 min.	**Coffee break**			
90 min.	**Minor surgery in General Practice – part 2**	Procedural skills in bodycheck after fall, suturing and bandaging Awareness, knowledge and procedural understanding for domestic violence	Assessment of previous skills, practical exercise with exemplary body check, bandaging and suturing (suturing, bandaging extremities on each other) Plenary lecture, Group discussion	Pig-feet, sewing-materials, bandage, presentation, print-out of cases Presentation, work sheets
60 min.	**Lunch break**			
90 min.	**Minor surgery in General Practice – part 3**	Synthesis of comprehensive treatment (including vaccincation, referral to surgeon / hospital, further consultations) Self-reflection on how to proceed on increasing competenciens in minor surgery	Plenary lecture, Group discussion Case-based discussions Discussion on how to implement minor surgery into daily practice	Presentation, work sheets, flipchart

Note. GP = General Practice

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

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How can competencies in minor surgery in General Practice be increased? Assessing the effect of a compact-intervention in postgraduate training – a mixed methods study

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How can competencies in minor surgery in General Practice be increased? Assessing the effect of a compact-intervention in postgraduate training – a mixed methods study

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Abstract

Objectives: We aimed to assess General Practice trainees' self-perception of surgical competencies and to explore long-term effects of a compact-intervention.

Design: We performed a mixed-methods study including a before and after comparison in the intervention-group (=IG), a comparison of attendees and non-attendees (=control-group=CG) and a long-term evaluation of the intervention. Competencies were self-assessed in surveys. Semi-structured interviews were performed 9 months afterwards.

Setting: In 2019, a two-day voluntary seminar focussing on minor surgery/injuries was offered 13 times by educators of the KWBW Verbundweiterbildung^{plus} (*Competence Centre for Postgraduate Medical Education Baden-Württemberg)*.

Participants: All GP trainees enrolled were offered participation. GP trainees who did not attend a seminar (=non-attendees) were recruited for CG after the 13th intervention.

Intervention: Attendees took part in an interactive, GP-oriented short course incorporating 270 minutes of focussed minor surgery/injuries training (=compact intervention) on the second day of the two-day seminar.

Results: 326 GP trainees (IG: n=257; CG: n=69) participated in the study. 17 attendees were interviewed. CG had more often experienced a surgical rotation (p=.03) and reported higher interest in performing minor surgery in future practice (p=.03). GP trainees self-rated their all-round competency in minor surgery as average (IG: 3.0±1.0, CG: 3.2±0.9, IG:CG p=.06). After the intervention, attendees felt that surgical skills should be a core component of GP vocational training (p=.05). At long-term review, attendees remembered a variety of content and valued the interactive, case-oriented, peer-to-peer approach in a mixed learning-group. Some attendees reported they had started to overcome competency-gaps in minor surgery.

Conclusions: A compact intervention in minor surgery provides an 'intense' stimulus which could foster positive attitudes towards minor surgery and promote long-term personal development of related competencies in GP trainees, including those with little interest in surgery. Such measures appear crucial to support individual progress of GP trainees to provide comprehensive primary care.

Keywords: Postgraduate medical education, General Practice, Primary Care, Basic surgical skills, Minor Surgery, Compact Intervention

Strengths and limitations of this study

- We recognise that a validated assessment of competencies could not be performed.
- We recognise that the seminar was voluntary and GP trainees with a previous surgical rotation were less likely to be recruited for participation in the intervention.
- We recognise that a randomisation was not applicable and recruitment of the control happened after all GP trainees were offered the chance for participation.
- We recognise that the intervention was not the only external influence on GP trainees.
- We emphasise that the long-term effects of the intervention could be explored by the addition of semi-structured interviews 9 months after the intervention.

1. Introduction

Primary healthcare, including General Practice (GP), aims to provide comprehensive, efficient and effective healthcare to everyone, everywhere (1). GP incorporates specific problem-solving skills as well as dealing with acute health problems such as injuries (2). To fulfil these tasks, General Practitioners (GPs) require specific competencies, including in "minor surgery". Competencies in medical education can be summarised as the *"knowledge, skills and attitudes required for the desired performance and behaviour"* (3). Minor surgery is defined as "*an operation on the superficial structures of the body or manipulative procedure that does not involve a serious risk"* (4). While identified as a necessary competency in GP, concerns of insufficient GP training in minor surgery are long standing (5) and persistent (6,7,8,9), particularly in countries without a robust primary care system (10,11). For Germany, there are variations in provision of minor surgery, including assessment and treatment of acute and chronic wounds, with regard to the physician's individual training and setting of the practice (urban/rural) (12,13).

Due to the wide breadth and specific requirements of GP, training programme directors have to decide on limits within the training curriculum. This is particularly pertinent for countries without a structured pedagogic programme, where vocational 'on the job' commitments restrict time for supplementary self-directed learning outside of clinical practice (14). However, even where GP training is clearly structured, such as in the UK, training in surgery is not a necessary component of the three-year training for GP (15).

In Germany, GP speciality training requires five years of postgraduate training, with mandatory rotations in internal medicine (12 months) and GP (24 months), in addition to 24 months of further training in other elective specialist rotations. Rotations in surgery are not mandatory. The first German postgraduate training programme in GP - the KWBW Verbundweiterbildung^{plus} *Competence Centre for Postgraduate Medical Education Baden-Württemberg* - aims to ensure basic competencies to help GP trainees master the challenges of primary care, including within rural areas. Since 2008, it offers a curriculum, seminar-programme, a structured mentoring-programme and regional clinical rotations across Baden-Württemberg as well as 'train-the-trainer' courses for educators (16,17).

GP trainees' attitudes towards and competency requirements for minor surgery have received little attention. This includes how basic surgical competencies could be ensured in a context of non-mandatory surgical rotations and limited annual time for a complementary programme during vocational training. In response to this, we designed a short training course (=compact intervention) on surgical competencies in our programme, specifically focussing on minor surgery/injuries in 2019. Educational compact interventions have shown to be feasible, effective and time-efficient means of fostering competencies of GP trainees in palliative care as well as self-care in the medium term (18,19). Based on this, we hypothesised that a compact intervention could be a useful approach to induce long-term competency development in minor surgery. Aims of this study were:

(1) to evaluate self-assessed competencies in basic surgery among GP trainees,

(2) to explore the effects of an educational compact intervention within a neglected clinical area,

(3) and to describe the long-term impact of the compact intervention.

2. Materials and Methods

2.1 Study design

The study examined GP trainees' confidence in basic surgical competencies in attendees and non-attendees of a training course in minor surgery, included a pre- and post-intervention survey among attendees as well as an exploration of effects 9 months post-intervention with the use of interviews.

2.2 Setting

All GP trainees enrolled in the KWBW Verbundweiterbildung*plus* were invited to participate in a two-day voluntary seminar focussing on minor surgery/injuries. All GP trainees were at some stage of their 5-year training, some with a previous surgical rotation. Participation in the two-day seminar was voluntary. A total of 13 two-day seminars were offered between January and December 2019. The seminars took place in seven different venues in Baden-Wuerttemberg, Germany. Participating GP trainees were invited to take part in the study (=intervention group, IG). Non-participating GP trainees (=non-attendees) were invited to the control group by email after the intervention period (=control group, CG).

2.3 Ethics

The study was embedded into a larger cohort study and approved by the Ethics Committee of the University of Heidelberg (S570/2015). Participation in the study was voluntary and not incentivised. All participants provided signed informed consent.

2.4 Patient and Public Involvement

Study design and development took place in 2018. Given the clinician focussed nature of the study, direct patient and public involvement was not mandated or recommended by the assessing research ethics committee.

2.4 Intervention

An interprofessional team of GP educators, practising GPs and nurses developed an educational compact intervention on minor surgery/injuries. In 2019, this compact intervention was integrated into the annual two-day training programme of the KWBW Verbundweiterbildung*plus*. The target number of participants was n=25 GP trainees per course. The main educational objective was to ensure participants gained the knowledge and skills required to treat patients presenting to GP with minor injuries. This included updating any previous surgical competencies. The hidden curriculum aimed to increase participants' self-efficacy and to establish a personal self-affirmation towards surgery. First the reasons for consulting were discussed (such as fall, bites, chronic wounds, head injuries) with the help of GP oriented, case-based scenarios. This was followed by practical exercises, including trauma-management, suturing or bandaging. The session concluded with self-reflection and discussion on the implementation of minor surgery into daily GP-Practice. The detailed course blueprint is presented as a supplementary file (Supplement 1).

2.5 Data collection

Attendees, including both GP trainees with, as well as without, a 6-month rotation in surgery, were asked to complete a paper-based questionnaire directly before (T1) and an online survey twelve weeks after the seminar (T2). Attendees were recruited to interview 9 months after the intervention period, recruiting both those with and without a previous rotation in surgery (T3). There was no financial incentive, we selected by voluntary response. Only attendees who had completed both surveys were eligible. Non-attendees were invited by e-mail to take part in a single online survey in March 2020 (T4). In the same e-mail we recruited for interviews. Only non-attendees who completed the survey were eligible. Data collection was completed in July 2020. Generally, those GP trainees included in planning of the study or with board-certification in a surgical speciality were excluded.

2.6 Measures and Outcomes (questionnaires)

Questionnaires developed by the study authors drawing on a comprehensive literature analysis, the Association for Medical Education in Europe (AMEE) guide 87 (20) and personal experience of medical training interventions were used (18,19) to assess study outcomes. Attendees as well as non-attendees rated 29 competencies in surgery using a five-point-Likert-scale (T1 and T4). Additional questions were added to the survey at T2 and for non-participants at T4 taking into consideration the different timepoints of data collection. All three versions of the questionnaire were piloted using a think-aloud technique with GPs and GP trainees before use (21). 5-point-Likert-Scale ranged from 1=none to 5=very good, 2-4 were not defined. Original surveys in German are provided as supplementary files (Supplement 2-4).

2.7 Interviews

Interviews were performed as semi-structured telephone interviews solely by a trained researcher with audio recording (SSte, MD, GP). The manual was developed by a team (n=4), whose members were familiar with the programme, the needs of the target learner-group and the current literature. The manual was piloted using think-aloud technique with two graduates from the programme with minor revisions before use. Main themes covered retrospective consideration of the intervention (including emotions) and its impact on the interviewee's current competencies in minor surgery.

2.8 Data analysis

2.8.1 Questionnaires

All quantitative data were analysed using the statistical programme SPSS (IBM Statistics, Version 25). Characteristics of GP trainees were summarised using descriptive statistics (absolute and relative frequencies (categorical variables), mean with standard deviation, and median with interquartile range (continuous variables)). Chi-square tests were used to detect differences in frequencies between the groups and Mann-Whitney U test for differences in rank

and continuous variables. Differences between T1 and T2 were analysed using t-tests for dependent samples and McNemar-tests.

2.8.2 Interviews

Interviews were transcribed verbatim (German). Data was analysed by three different researchers using the structured qualitative content-analysis approach of Kuckartz (22) and with the aid of MAX-QDA (VERBI GmbH, Berlin, Germany). All quotations in the manuscript were forward translated, with critical review and revision by a native English speaker fluent in German (AP; researcher in GP). A COREQ-List is provided in the supplements (supplement 5).

3. Results

In 2019, n=379 GP trainees participated in the curriculum of the KWBW Verbundweiterbildung*plus*. N=281 GP trainees attended one out of 13 independent two-day seminars including the intervention (mean n=21, range 15-31). GP trainees in the study team as well as those with a previous board-certification in a surgical field were excluded from participation (n=3 / n=15). The response rate for pre-intervention questionnaires at T1 was high (98%, n=257/263), decreasing for post-intervention questionnaires at T2 (response rate 53% n=135/257). Of 98 GP trainees invited to the control group, two third participated (response rate 70%, n=69/98). In total, 326 GP trainees (IG: n=257, CG: n=69; 86% of all GP trainees) participated in the study.

A total of 30 interviews were completed 9 months post-intervention. Mean interview duration was 27 minutes 54 seconds. (Minimum 14 minutes 9 seconds, Maximum 38 minutes 26 seconds). In the IG (n=17), 9 attendees had previous surgical experience (=rotation) compared with 8 who had not. In the non-attendees' group, 13 GP trainees participated in the interviews of which 6 had previous surgical experience (=rotation) compared with 7 who had not.

3.1 Sociodemographic data

Sociodemographic data for the IG and CG are presented in Table 1. 18.3% of IG (n=47) and 17.3% of CG (n=12) were older than 40 years. On average, the IG were in the fourth and CG in the fifth year of training (T1:CG, $p<0.01$). 34% of IG (n=89) and 49% of CG (n=34) had previously undertaken a rotation in surgery (p=0.03). Of those participating in the interviews, median age was 34.5 yrs. (Q1:33, Q3:35.75) and 73% were female (n=22, n=8 male). Mean duration of GP training was 3.8 yrs. (SD=0.83).

Table 1

Sociodemographic data and prior surgical experience of GP trainees (n=326)

		IG T1 (n=257)	IG T2 (n=135)	CG (n=69)	T1:CG (p)
Gender (n, %)	Female	187 (72.8%)	82 (60.7%)	57 (82.6%)	.08[1]
	Male	62 (24.1%)	18 (13.3%)	10 (14.5%)	
	Unknown	8 (3.1%)	35 (25.9%)	2 (2.9%)	
Age (in years)	**Md (Q1; Q3)**	**35 (32; 39)**	**34 (32; 39)**	**36 (34; 38)**	.08[2]
	Min-Max	27-62	27-60	28-52	
Year of training	Md (Q1; Q3)	4 (3; 5)	4 (3; 5)	5 (4; 5)	**<.01[2]**
	Min-Max	1-5	1-5	3-5	
Current rotation (n, %)	Outpatient / community or GP	204 (79.4%)	81 (60.0%)	61 (88.4%)	.12[1]
	Hospital	41 (16.0%)	17 (12.6%)	6 (8.7%)	
	Unknown	12 (4.7%)	37 (27.4%)	2 (2.9%)	
Are you currently undertaking or have completed a rotation in a surgical speciality?		Y 89 (34.6) N 163 (63.4) Unknown 5 (1.9)	Y 36 (26.7%) N 60 (44.4%) Unknown 39 (28.9%)	Y 34 (49.3) N 34 (49.3) Unknown 1 (1.4)	**.03[1]**
Have you gained surgical competencies outside of medical or postgraduate medical education (e.g., training as paramedic)?		Y 67 (26.1) N 175 (68.1) Unknown 15 (5.8)	Y 29 (21.5%) N 68 (50.4%) Unknown 38 (28.1%)	Y 15 (21.7) N 53 (76.8) Unknown 1 (1.4)	.35[1]

Note. GP=General Practice, T1: before intervention, T2: 12 weeks after intervention, IG= intervention group, CG=control group, p: p-value M: Mean, SD: Standard Deviation, Md: Median, Q1,Q3: interquartile range, [1]: chi-square (without "unknown" category), [2]: Mann-Whitney-U-Test

3.2 Self-assessed competencies (survey)

Table 2 depicts self-perceived competencies of GP trainees, with comparison of attendees (IG) and non-attendees (CG). GP trainees rated their all-round competency in the management of conditions requiring minor surgery within GP in the mid-range of a 5-point-Likert scale (maximum of 5) (IG at T1: 3.0±1.0, CG at T3: 3.2±0.9, IG:CG p=.06) [How do you estimate

your all-round competencies in the treatment of surgical clinical pictures in General Practice? (M±SD)].

Table 2

Tab.2 - Self-assessment of competencies in basic surgery of General Practice trainees (n=326)

	IG T1 (n=257)	CG (n=69)	IG T1:CG (p)
How competent do you feel at examining traumatic injury affecting the following parts of the body? (M, SD)			
Shoulder joint	3.1 (1.0) n=256	3.0 (0.9)	.40
Elbow joint	2.9 (1.0) n=256	2.9 (1.1)	.66
Wrist joint	3.1 (1.0) n=256	3.1 (1.0)	.93
Finger joints	3.3 (1.0) n=256	3.3 (1.0)	.98
Hip joint	3.4 (0.9) n=256	3.2 (1.0)	.11
Knee joint	3.5 (0.9) n=256	3.4 (1.0)	.35
Ankle joint	3.2 (1.0) n=256	3.2 (1.0)	.80
Cervical spine	3.0 (0.9) n=255	2.7 (1.1)	**.03**
Thoracic spine	3.1 (0.9) n=255	2.8 (1.0)	.01
Lumbar spine	3.2 (0.9) n=254	3.1 (1.0)	.22
Rate your competencies in… (M, SD)			
Assessment of wounds	3.5 (0.9)	3.8 (0.8) n=68	**.02**
Treatment of acute wounds	3.4 (1.0) n=255	3.7 (0.9) n=68	.10
Treatment of chronic wounds	3.0 (1.0)	3.3 (1.0) n=68	**<.01**
Treatment of infected wounds	2.9 (1.0) n=255	3.3 (1.0) n=68	**<.01**
Postoperative care of fractures	3.2 (1.1) n=255	3.3 (1.0) n=68	.55
General documentation of injuries	3.2 (1.0) n=256	3.5 (0.9) n=68	.07
Assessment of vaccination need after injuries	4.0 (0.9)	4.2 (0.8) n=68	.06
Knowledge of specific features of occupational injuries	2.9 (1.1) n=255	2.9 (1.2) n=68	.68
Instigating supports/splints and rehabilitation	2.7 (1.0)	2.8 (1.0) n=68	.41
Organisation of supportive care in the community	2.8 (1.0) n=254	2.8 (1.0) n=68	.80
How competent do you feel at initiating treatment in the following clinical presentations? (M, SD)			
Contusion	3.8 (0.9)	4.2 (0.8) n=68	**<.01**
Sprain	3.5 (1.1)	3.6 (1.1) n=68	.55
Luxation	2.7 (1.1)	2.5 (1.1) n=68	.32
Bite wounds	3.1 (1.1) n=256	3.3 (1.1) n=68	.10
Foreign bodies wounds	3.0 (1.0) n=254	3.1 (1.1) n=68	.60
Burns	3.0 (1.0)	3.1 (1.0) n=68	.47
Fracture	3.1 (1.0) n=256	3.0 (1.1) n=68	.58
Head and neck injury/trauma	3.0 (1.1) n=256	2.9 (1.1) n=68	.39
Domestic violence related injuries	2.6 (1.0) n=256	2.4 (1.1) n=68	.23

Note. GP: General Practice, T1: before intervention, T2: 10 weeks after intervention, IG= intervention group, CG=control group, p: p-value, M: Mean, SD: Standard Deviation, t-test, Likert scale (1-5, max.=5)

At T1, CG self-rated their competencies significantly better than IG in the assessment and treatment of acute and chronic wounds (p=0.02, p<0.01, p<0.01) as well as in initiating

treatment in contusion (p<0.01). The IG rated their competencies significantly better in post-traumatic physical examination of cervical spine (p=0.03). Overall, despite assessment on tetanus prevention and initiating treatment in contusion, both groups rated their competency in the mid-range.

3.3 Effects of the intervention (survey)

GP trainees' responses on the effects of the compact-intervention in basic surgery are also displayed in Table 3. After the training intervention, the IG rated their all-round competencies at 3.1±1.0 on a 5-point-Likert (T1:T2: p=.43). Interest in surgical presentations was

Table 3

Tab. 3 – Effects of a compact-intervention in basic surgery for GP trainees (n=326)

	IG T1 (n=257)	IG T2 (n=135)	CG (n=69)	IG T1: CG (p)	IG T1:T2 (p), n=100
How reasonable do you consider the following to be…					
A rotation in a surgical specialty during GP vocational training? (M, SD)	4.4 (0.8) n=256	4.4 (0.8)	4.2 (1.1)	.16	.68
A **mandatory** rotation in surgery during GP vocational training? (M, SD)	3.1 (1.3) n=256	3.3 (1.3)	3.9 (1.1)	**<.01**	**.05**
How would you rate your interest…?					
In surgery (in general)? (M, SD)	3.9 (0.9) n=255	3.9 (1.0)	3.7 (1.0)	.11	.30
In surgical presentations within General Practice ("minor surgery") (MD, SD)	4.1 (0.9) n=255	3.8 (1.1)	4.1 (1.1)	.97	**<.01**
In a GP-Practice rotation during vocational training which regularly offers "minor surgery"? (M, SD)	4.1 (1.0) n=256	4.1 (1.1)	4.4 (0.9)	**.03**	.09
In personally performing "minor surgery" in your future practice? (M, SD)	3.8 (1.2) n=255	3.7 (1.3)	4.1 (1.1)	**.03**	.57
As a result of the intervention, how highly would you rate your agreement with the following statements:					
I feel more confident in the treatment of patients with injuries.	n/a	3.2 (1.0)	n/a	n/a	n/a
I feel more competent in the treatment of patients with injuries.	n/a	3.1 (0.9)	n/a	n/a	n/a
I require direction from my GP-trainer on patients with injuries less often.	n/a	2.8 (1.0)	n/a	n/a	n/a

My interest in treating patients with injuries in GP has increased.	n/a	3.2 (1.1)	n/a	n/a	n/a

Note. GP: General Practice, T1: before intervention, T2: 10 weeks after intervention, IG= intervention group, CG=control group, p: p-value, M: Mean, SD: Standard Deviation, t-test, Likert scale: 1: very bad to 5: very good

lower after the training ($p<0.01$). At T2, GP trainees were more likely to agree that a surgical rotation should be a mandatory component of GP vocational training ($p=.05$). A non-responder analysis did not reveal any differences in the IG. At T1, the CG were already more likely to approve of a mandatory surgical rotation (3.9:3.1, $p<0.01$), interest in a rotation in a GP practice offering minor surgery ($p=0.03$) and interest in offering minor surgery in future practice ($p=0.03$) compared with IG.

3.4 Expectations and effects of the intervention (interviews)

Participant expectations are summarised as themes in Table 4. Both groups felt the compact intervention was relevant to routine GP. Participants expected the intervention to provide practice-oriented knowledge and skills, including structured procedures/algorithms on management within GP and when to refer to secondary care. Long-term, post-intervention codes were categorised into six categories (Table 5): part I summarizes *strengths of the intervention - general*, *strengths – peer to peer* and *weaknesses*; part II presents further categories (*content remembered, conclusion and impact on attitude and behaviour*).

Table 4

Tab. 4 – Expectations of GP trainees on a compact-intervention in basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Rating	No expectations	No expectations Low level of confidence in the topic. Promising title
Assessment of relevance	Relevant theme Common reason for GP consultation	Relevant for consultation in GP Relevant for personal training

		Challenge to implement surgery in GP
Exceptions with regards to content	Desire for structured procedural guidance and identification of red flags	Desire for structured procedural guidance / algorithm
	Desire for support in undertaking procedures independently	Desire for support in undertaking procedures independently
	Theoretical background / knowledge	Desire for competencies
	Wound dressing	Wound dressing
	Wound management such as suturing or glue application	
	Vaccination	
	Postoperative organisation	
	Postoperative analgesia	

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, themes presented after qualitative content-analysis in regard to Kuckartz (22)

Participants with and without previous surgical experience rated the mixed learning groups highly, feeling they helped to establish a positive peer-learning atmosphere.

#18 (no rotation in surgery): *"Well, I liked it. Especially as a beginner, it was good to realise that the others haven't mastered everything; that there were colleagues who have worked for several years yet haven't done many surgical procedures."*

#20 (2 yrs. in surgery): *"Well, I was really excited by the topic. Even though I didn't learn much new knowledge, the topic itself, while partly a repetition, got to the point on how it (minor surgery) could be and really is practiced in GP."*

#30 (6 mo. in surgery): *"Well I was heavily involved in surgery at that time and that is why it was a little redundant for me (...) it was enjoyable to do the exchange with those who have not done surgery in years, perhaps last time during medical school, and others who had more experience than me. To apply basic principles to GP was really good then."*

Participants were motivated to develop their surgical competencies, even if they previously had a negative attitude towards surgery:

> ***#18 (no rotation in surgery):*** *"Yes, so it has shown me that basic surgical skills are really important for general practice. To be honest, I didn't really like surgery during medical school, but I did have a positive experience in the final year (of medical school), and this seminar has strengthened that (position), that it is really cool if you are able to do such things in the general practice by yourself, yes, certain things on your own. That was my impression, that I would absolutely want to reinforce."*

Table 5 (part I)

Tab. 5 part I – Long-term evaluation of a compact-intervention on basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Strengths of the intervention - general	Alignment with the competence-based curriculum in General Practice	Case-based learning
	Gain in knowledge in comparison with the previous rotation (burns injuries)	Beneficial despite low level of personal competence in the topic
		Increased participants' self-efficacy
	Refresher	Focus on application in GP
	Procedural guidance (out-/in-patient). What can I do on my own / when do I admit to hospital?	Real-life cases from day-to-day GP
	Practical exercises – bandaging	Practical exercises – Oberst' conductive anaesthesia Practical exercises – physical examination of joints Suture practice Splinting after suspected fracture
	Educational methods – picture quiz	Educational methods – picture quiz Educational methods – group work
	Teaching aids – bandaging	Teaching aids – wound dressing
	Focus on application – how to perform minor surgery in practice	Interactive learning
		Comprehensive approach – post-fall injuries presenting alongside musculoskeletal trauma e.g. abdominal injury
		Lecturers (experienced GPs)
		Encouragement and increased self-confidence
Strengths of the	Interactive learning and exchange with peers	Learning from peers

intervention – peer to peer		Realisation of different levels of competence (motivating)
	To reflect on various management approaches	Collective learning enabled group work
	Exchange of experiences	Realisation of learning/competency gaps (due to comparison)
		Heterogeneity is beneficial
Weaknesses of the intervention	Reduced learning success without experience in GP practice	Reduced learning success without experience in GP practice
	Skills redundant given previous surgical rotation	Excessive pressures if in first year of training
	Skills in suture not necessary	Too few practical exercises
	Not enough teaching on wound dressing	Not enough training in suturing
	One lecturer expanded on emergency medicine too much (not relevant for GP)	Not enough group works
		Chronic wounds not part of the intervention

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, themes presented after qualitative content-analysis in regard to Kuckartz (22)

Furthermore, participants were motivated to improve their gaps in surgical competencies by addressing the issue, particularly through learning from peers. The intervention was a challenging but positive experience on the GP trainees' competencies.

> ***#34 (no rotation in surgery):*** *"Yes, I had a bad feeling about wound management, I didn't know where to start. I recognised I really had to do something about this. That was what it provoked, it wasn't really a bad feeling in the end, but more that it was „good to have been confronted with that", that I have reflected on that, that I have to deal with minor surgery in GP, that I have to improve for my patients."*

> ***#6 (no rotation in surgery):*** *"Well, I asked the medical staff (at my practice) and my trainer if I could be involved with the management of wounds, so that I just can see it. Yes, sometimes it works well and sometimes less so, because I also have consultations (with my own patients), but I felt that, ok somehow, I have somehow to gain greater experience and therefore also to organise (learning) situations, to at least have tried doing it.*

One beneficial aspect of the intervention was participant reflection and discussion on how minor surgery could be offered in routine GP. This included areas where it was seen as more (outside of cities) and less applicable (in urban areas with many surgeons and hospitals).

> ***#28 (6 mo. in surgery):*** *"Yes actually what is possible in GP (...) I think the lecturer mentioned that treatment of wounds in GP is becoming less frequent because it is not adequately financially reimbursed, and that you have to provide sterile materials and such things. But nevertheless, that he has shown what you can offer without having the arsenal of an emergency department to hand, which care you could provide. Yes, I really liked that, it gave me a realistic picture of what to expect in practice."*

Table 5 (part II)

Tab. 5 part II – Long-term evaluation of a compact-intervention on basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Content remembered	Reflection and exchange on which level of minor surgery can be offered in General Practice	Many practical exercises / skills
	Practical exercises – suturing	Practice exercises – suturing
	Practice exercises – bandaging	Practical exercises – bandaging (compression bandage, Finger bandaging)
	Practical exercises – splinting	Practical exercises – physical examination of joints
	Picture quiz	Picture quiz
	Wound dressing	Wound management procedures in GP
	A challenge after 1 year	Burns injuries, ‚rule of palm'
Conclusion	Very helpful for General Practice!	Very good and practice-oriented
	Very informative!	Good and informative!
	Outstanding!	Content way better than expected from the title
	Convenient	Very relevant
	I liked it	Group work - enabled getting to know colleagues
	Slightly boring	Stimulus to meet learning/competency needs
	Exchange of different opinions	Rapid overview
	Exciting despite some overlapping with previous surgical rotation	I can't remember
	Inspiration for GP (boost in motivation)	Now I can benefit from it

Impact on attitude and behaviour	Realisation that minor surgery by General Practitioners is mostly offered in "rural" areas	Intense stimulus to meet learning/competency gaps (during GP rotation)
		Established ways to develop competency (e.g. see as many patients with wounds as possible)
	Wish to offer minor surgery	Stimulus to apply for a rotation in surgical training (despite reservations against surgery)
		Work shadowing in surgery
	Regret that minor surgery in GP is only possible at a limited level	Rotation in surgery training
		Minor surgery in General Practice could be learned in rural GP Practices
		Realisation of learning/competency gaps (due to comparison with others) and realistic self-perception
		Approval of relevance of minor surgery in GP
		Increased wish to gain competencies in surgery
		Increasing wish to offer minor surgery in GP
		Wish for further future courses
		Frequent use of finger bandaging

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, themes presented after qualitative content-analysis in regard to Kuckartz (22)

3.5 Non-attendees (interviews)

Non-attendees were asked why they did not participate in the compact intervention, what could have enabled successful participation and what they had expected of the intervention. There were no differences in responses between those with and those without surgical experience. Reasons for non-attendance were: insufficient support from employers (no time for participation, no financial support), incompatibility of an over-night stay with family duties, not being in Germany at the time of intervention, and acute sickness. Release and financial aid by the employer as well as the offer to participate in the intervention in a one-day format or child-care would have supported participation. The non-attendees rated the intervention theme as both relevant and frequently utilisable within GP. Those unable to participate due to acute sickness expressed regret at non-attendance, due to the perceived value of the topic, the collegial and positive atmosphere and the chance for peer-learning.

4. Discussion

To the best of our knowledge this is the first study to assess subjective competencies in basic surgical skills among GP trainees in Germany and to explore the effects of a compact intervention after 9 months. Due to the comparatively high number of participants, the study also represents a valuable addition to existing international studies. The aims of the study could be met: We identified that GP trainees in Germany perceive their surgical competencies as average. We observed that attendees were less-likely to have a previous surgical rotation but favoured a mandatory surgical rotation for all GP trainees after the compact intervention. Interviews revealed that due to the intervention there could be a positive change of attitudes towards minor surgery in general as well as a change in behaviour to overcome gaps in surgical competencies even among attendees not attracted by minor surgery.

At first, the baseline surveys identified low self-efficacy and perceived insufficient training in minor surgery amongst current GP trainees in Germany. Early exposure to surgical skills supports medical students to establish a competency foundation which can be developed further during residency training (23). Nevertheless, continuity in training is valuable (7) and surgical skills form one component of broad primary care, a necessity in rural areas (13). We found that one third of the IG and half of the CG experienced a rotation in surgery during postgraduate medical education. Furthermore, the CG was more likely to search for a training post in GP with minor surgery and to perform minor surgery in future practice compared with the IG. We recognise that the intervention attracted GP trainees less interested in minor surgery.

After 12 weeks the compact intervention significantly changed the GP trainee's attitudes towards a mandatory surgical rotation during GP speciality training. Concurrently, attendees reported reduced interest in surgical presentations in GP as well as no increase in the attitude to perform minor surgery in GP in future practice could be observed. We think that attendees

gained a realistic understanding of minor surgery and became aware of their own competency gaps. We feel this likely led to them starting to favour a compulsory surgical rotation in GP training.

After 9 months, attendees described the advantages and disadvantages of the compact intervention as well as its effects in detail. The intervention was perceived as an intense but non-offensive stimulus to deal with personal competencies in minor surgery. Thereby, the compact intervention promoted GP trainees' competency development in the long term. Educational compact interventions have previously been demonstrated to foster knowledge gains, skill acquisition, attitudinal and behaviour change in GP trainees in the short and mid-term (18,19, 24). This goes hand in hand with the learning-theory of Sagasser et al. (25), who postulated a short-time and long-time learning loop of GP trainees. The current compact intervention positively stimulated GP trainees' self-directed learning. This was likely achieved through creation of a positive attitude, goal setting and motivational encouragement to utilise competencies in practice. Boosting motivation appeared highly correlated with a positive learning atmosphere and re-affirmation of previous competencies. Motivation could be even described as prerequisite for learning in general (26).

The effective compact intervention of the present study included experienced GPs as lecturers, an interactive learner-oriented educational approach, a positive learning atmosphere, case-based scenarios and integration of the learner's daily life (practical approach). This study identified another effect of compact interventions: The peer-to-peer learning in a mixed learner's group turned out to be beneficial for two reasons: 1) participants intensified their learning by the peers' perspectives or being an instructor themselves, and 2) by comparing themselves with peers (comparison): '*If a peer can handle minor surgery in GP, I can also*

master it!'. Interviewees reported that peer-to-peer learning emblematised performance of minor surgery in GP as both feasible and necessary. However, whereas comparison appears appropriate, "real" competition should be avoided as it may negatively influence memory within learning processes (27).

In summary, the study was designed to explore the long-term changes after a compact-intervention and to meet the various limitations natural for educational interventions. The intervention increased GP trainees' motivation to address competency-gaps in the long term. with regards to a previous study on a compact intervention in another neglected field of primary care (end of life care) (18), the sequence of learning could be the following: Firstly, self-awareness of competency gaps in minor surgery but accompanied with skills and motivation to deal with them (=compact intervention in minor surgery, preferable in the first year of training). Then secondly, seeking for learning environments either in a surgical department, surgical practice or general practice, to gain competencies in minor surgery. In consequence, all GP trainees should ideally seek out practices which offer minor surgery.

Strengths and Limitations

To our knowledge, this is the first study to explore self-assessed competencies in basic surgery among GP trainees in Germany, as well as to longitudinally evaluate a compact intervention in minor surgery/injuries. We recognise that: firstly, participation was voluntary, meaning randomisation was not applicable and selection bias cannot be ruled out. Voluntary participation meant that dropout occurred between T1 and T2. Responder / non-responder analysis did not reveal any differences. Secondly, the extent to which other external factors may have influenced trainees' competency development after the intervention, including knowledge and skills in practice, is unclear. As such, quantifying the effects of the intervention must be

seen within a wider training and development context. This accounts for our extensive qualitative component within the mixed-methods study. As we followed an exploratory approach, we did not correct for multiple testing. This could have led to an over-estimation of the observed effects, especially since competencies are not independent of each other. Still, the observed group means show relevant differences. Thirdly, validated assessment of competencies (written and/or oral and/or practical such as directly observed procedures) could not be implemented. Fourthly, the intervention was performed face-to-face in 2019. Further research would be required to identify whether findings can be replicated using virtual training methods, for example online. Finally, GP trainees undertaking the KWBW Verbundweiterbildung*plus* training programme may have known each other prior to study commencement. This prior cohesiveness may have influenced the learning atmosphere and thereby fostered a gain in competencies (28).

Conclusion

A compact intervention in minor surgery as presented could induce changes in behaviour as well as learning even among those GP trainees with little interest in surgery (mind change). In doing so, it could help GP trainees to gain competencies in minor surgery and be empowered to offer comprehensive primary care. Further research is necessary to explore which organisational and reimbursement structures are required to ensure training of GP trainees and educators in minor surgery is sustainable and whether this translates in effective long-term care provision.

Declarations

Competing interests

SSwl, DR, JSz and SSte were involved in the organisation of the training program KWBW Verbundweiterbildung*plus*. All authors declare no further competing interests.

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Abbreviation

CG	Control Group
GP	General Practice
GPs	General Practitioners
KWBW	*Kompetenzzentrum Weiterbildung Baden-Württemberg*
Verbundweiterbildung*plus*	(GERMAN) = Competence Centre for Postgraduate Medical Education Baden-Württemberg (Registered ®, German patent office, Munich, Germany)
IG	Intervention Group

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Author's contribution

SSwl contributed to conception and design of the study, to acquisition, analysis and interpretation of data and to drafting and revising the manuscript. KK contributed to design of the study, to analysis and interpretation of data and to revising the manuscript. AP contributed to analysis and interpretation of data and to drafting and revising the manuscript. DR contributed to acquisition and analysis of data and revising the manuscript. JSe contributed to interpretation of data and to revising the manuscript. JSz contributed to interpretation of data and to revising the manuscript. SSte contributed to design of the study, to acquisition, to analysis and to the interpretation of data and to drafting and revising the manuscript. All authors read and approved the final manuscript.

Data sharing statement

Data is available from the corresponding author (SSwl) at reasonable request. The original dataset is in German.

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Figure 1

Blueprint: A compact intervention for General Practice Trainees aiming at the improvement of competencies in minor surgery				
Schedule	**Step**	**Aim**	**Methods**	**Tools and material**
Pre-interventional survey				
90 min.	**Minor surgery in General Practice – part 1** **"I have fallen down the stairs / I have cut myself"**	Introduction, reflection on personal level of competence Knowledge and how to do it: common algorithms on how to proceed with different consultations in general practice (e.g. fall, contusion, fracture, acute wounds, bites, foreign bodies), red flags as well as watchful waiting	Group discussion on previous knowledge and experience, lecture, case-based plenary discussions, group-work on cases	Survey on previous skills, presentation, chart request, print-out of cases /work sheets
30 min.	**Coffee break**			
90 min.	**Minor surgery in General Practice – part 2**	Procedural skills in bodycheck after fall, suturing and bandaging Awareness, knowledge and procedural understanding for domestic violence	Assessment of previous skills, practical exercise with exemplary body check, bandaging and suturing (suturing, bandaging extremities on each other) Plenary lecture, Group discussion	Pig-feet, sewing-materials, bandage, presentation, print-out of cases Presentation, work sheets
60 min.	**Lunch break**			
90 min.	**Minor surgery in General Practice – part 3**	Synthesis of comprehensive treatment (including vaccincation, referral to surgeon / hospital, further consultations) Self-reflection on how to proceed on increasing competenciens in minor surgery	Plenary lecture, Group discussion Case-based discussions Discussion on how to implement minor surgery into daily practice	Presentation, work sheets, flipchart

Note. GP = General Practice

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Verletzungen in der hausärztlichen Praxis

Selbsteinschätzungsbogen für Ärztinnen/Ärzte in Weiterbildung

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1	2	3	3b	4	5

Liebe Ärztinnen und Ärzte in Weiterbildung,
bitte gebt in den folgenden Antwortmöglichkeiten an, wie ihr eure **Kompetenzen in der Versorgung von Patienten mit Verletzungen in der hausärztlichen Praxis bzw. in der Organisation der weiteren Versorgung** (z.B. Einweisung in eine Klinik) selbst einschätzt. **Vielen Dank für eure Teilnahme!**

[1]Vorab: **Begriffsdefinition „Kleine Chirurgie“:** Kleinchirurgische Eingriffe wie z.B. Abszess-Eröffnung oder primäre Wundversorgung mittels Naht

	Als wie **sinnvoll** erachtest du…	Gar nicht sinnvoll				sehr sinnvoll
1	eine Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
2	eine **verpflichtende** Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
	Als wie hoch würdest du dein **Interesse** bezeichnen…	Gar kein				sehr hoch
3	an chirurgischen Inhalten (**allgemein**)?	○	○	○	○	○
4	an chirurgischen Inhalten **in der Hausarztpraxis** (sog. kleine Chirurgie[1])?	○	○	○	○	○
5	deine Weiterbildung in einer Hausarztpraxis zu absolvieren, in der regelmäßig kleine Chirurgie[1] durchführt wird?	○	○	○	○	○
6	selbst in deiner zukünftigen Tätigkeit als Hausarzt/Hausärztin auch sog. kleine Chirurgie[1] durchzuführen?	○	○	○	○	○

7	Wie schätzt du deine **Kompetenzen** in der **ambulanten** Versorgung chirurgischer Krankheitsbilder **insgesamt** ein?	keine ○	○	○	○	sehr gut ○

	Wie schätzt du deine Kompetenzen ein, bei **Patienten mit Trauma** folgende Körperregionen zu **untersuchen**:	keine				sehr gut
8	Schultergelenk	○	○	○	○	○
9	Ellenbogengelenk	○	○	○	○	○
10	Handgelenk	○	○	○	○	○
11	Fingergelenke	○	○	○	○	○
12	Hüftgelenk	○	○	○	○	○
13	Kniegelenk	○	○	○	○	○
14	Sprunggelenke	○	○	○	○	○
15	Halswirbelsäule	○	○	○	○	○
16	Brustwirbelsäule	○	○	○	○	○
17	Lendenwirbelsäule	○	○	○	○	○

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	Beurteile deine **Kompetenzen** in:	**keine**				**sehr gut**
18	Einschätzung von Wundverhältnissen	○	○	○	○	○
19	Behandlung akuter Wunden	○	○	○	○	○
20	Behandlung chronischer Wunden	○	○	○	○	○
21	Behandlung infizierter Wunden	○	○	○	○	○
22	Versorgung von Frakturen **postoperativ**	○	○	○	○	○
23	Allgemeine Dokumentation von Verletzungen	○	○	○	○	○
24	Beurteilung notwendiger Impfungen bei Verletzungen	○	○	○	○	○
25	Kenntnis der Besonderheiten eines BG Falles	○	○	○	○	○
26	Verordnung von Hilfs- und Heilmitteln	○	○	○	○	○
27	Organisation ggf. notwendiger pflegerischer Versorgung zu Hause	○	○	○	○	○

	Wie schätzt du deine Kompetenzen in der **akuten Versorgung** folgender Krankheitsbilder hinsichtlich der **Einleitung einer adäquaten Therapie** ein?	**keine**				**sehr gut**
28	Prellungen	○	○	○	○	○
29	Distorsionen	○	○	○	○	○
30	Luxationen	○	○	○	○	○
31	Bissverletzungen	○	○	○	○	○
32	Fremdkörperverletzungen	○	○	○	○	○
33	Verbrennungen	○	○	○	○	○
34	Frakturen	○	○	○	○	○
35	Schädelhirntraumata	○	○	○	○	○
36	Verletzungen durch häusliche Gewalt	○	○	○	○	○

37	Hast du eine Rotation in die Chirurgie absolviert oder arbeitest aktuell in einer chirurgischen Fachabteilung?	☐ ja ☐ nein
37a	Wenn ja, in welcher/n chirurgische/n Fachabteilung/en warst bzw. bist du tätig? (Mehrfachnennung möglich)	☐ Orthopädie/ Unfallchirurgie ☐ Allgemein-/Viszeralchirurgie ☐ Thorax Chirurgie ☐ Herzchirurgie ☐ sonstiges (bitte Freitext nutzen)
	Freitext:	
37b	Wenn ja, wo warst bzw. bist du chirurgisch tätig? (Mehrfachnennung möglich)	☐ stationär ☐ ambulant
37c	Wenn ja, wie lange warst du insgesamt chirurgisch tätig bzw. wirst du voraussichtlich tätig sein?	☐ bis 3 Monate ☐ 4-6 Monate ☐ 7-12 Monate ☐ mehr als 12 Monate

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38	Für Quereinsteiger: Ich bin Facharzt in einer chirurgischen Disziplin	☐ ja ☐ nein
38a	Wenn ja, in welcher chirurg. Fachdisziplin?	*Freitext:*

39	Hast Du außerhalb des Studiums oder der Facharztweiterbildung chirurgische Erfahrungen gesammelt? (z.B. Rettungsdienst oder Pflegedienst)	☐ ja ☐ nein
39a	Wenn ja, wo hast du chirurgische Erfahrungen gesammelt?	*Freitext:*

40	Dein Geschlecht?	☐ w ☐ m ☐ divers	
41	Wann bist du geboren?	☐☐ /19☐☐	Monat/Jahr (z.B. 05/1986)
42	In welchem Jahr der Weiterbildung befindest du dich?	☐	(1 bis 5 Vollzeit-Äquivalent)
43	In welchem Weiterbildungsabschnitt befindest du dich?	☐ stationär ☐ ambulant	

Hast du noch Anmerkungen zu oder Vorschläge für den Fragebogen **Verletzungen in der hausärztlichen Praxis**?	*Freitext*

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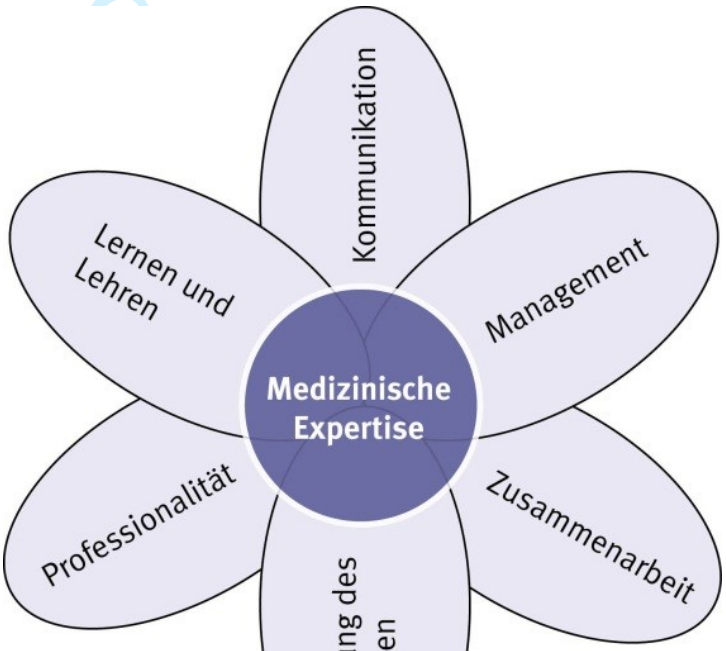
NACHBEFRAGUNG Verletzungen in der hausärztlichen Praxis

Selbsteinschätzungsbogen für Ärztinnen/Ärzte in Weiterbildung



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	Als wie **sinnvoll** erachtest du…	Gar nicht sinnvoll				sehr sinnvoll
1	eine Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
2	eine **verpflichtende** Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
	Als wie hoch würdest du dein **Interesse** bezeichnen…	**Gar kein**				**sehr hoch**
3	an chirurgischen Inhalten (**allgemein**)?	○	○	○	○	○
4	an chirurgischen Inhalten **in der Hausarztpraxis** (sog. kleine Chirurgie[1])?	○	○	○	○	○
5	deine Weiterbildung in einer Hausarztpraxis zu absolvieren, in der regelmäßig kleine Chirurgie[1] durchführt wird?	○	○	○	○	○
6	selbst in deiner zukünftigen Tätigkeit als Hausarzt/Hausärztin auch sog. kleine Chirurgie[1] durchzuführen?	○	○	○	○	○

7	Wie schätzt du deine **Kompetenzen** in der **ambulanten** Versorgung chirurgischer Krankheitsbilder **insgesamt** ein?	**keine** ○	○	○	○	**sehr gut** ○

Als wie hoch würdest du deine **Zustimmung** zu folgenden Aussagen bewerten? **Durch den Doppelseminartag 2019…**		**Gar keine**				**sehr hoch**
8	…fühle ich mich **sicherer** in der Versorgung von Patienten mit Verletzungen.	○	○	○	○	○
9	…fühle ich mich **kompetenter** in der Versorgung von Patienten mit Verletzungen.	○	○	○	○	○
10	…versorge ich Patienten mit Verletzungen **eher selbst**.	○	○	○	○	○
11	…halte ich bei Patienten mit Verletzungen **seltener Rücksprache** mit meinem Weiterbilder / meiner Weiterbilderin.	○	○	○	○	○
12	…hat sich **mein Interesse** für die **Versorgung von Verletzungen** in der Hausarztpraxis gesteigert.	○	○	○	○	○
13	…hat sich **mein allgemeines chirurgisches Interesse** gesteigert.	○	○	○	○	○

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14	Als wie wichtig erachtest du Seminare mit chirurgischen Inhalten innerhalb der ärztlichen Weiterbildung für Allgemeinmedizin?	**Sehr unwichtig** ○ ○ ○ ○ ○ **sehr wichtig**

15	Was hättest du dir im Seminar noch gewünscht?	
	Freitext (stichwortartig)	

16	Hast du seit dem Doppelseminartag eine Rotation in einem chirurgischen Fach begonnen?	☐ ja ☐ nein

Hast du noch Anmerkungen?	*Freitext*

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Verletzungen in der hausärztlichen Praxis

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	Als wie hoch würdest du dein **Interesse** bezeichnen…	Gar kein				sehr hoch
3	an chirurgischen Inhalten (**allgemein**)?	○	○	○	○	○
4	an chirurgischen Inhalten **in der Hausarztpraxis** (sog. kleine Chirurgie[1])?	○	○	○	○	○
5	deine Weiterbildung in einer Hausarztpraxis zu absolvieren, in der regelmäßig kleine Chirurgie[1] durchführt wird?	○	○	○	○	○
6	selbst in deiner zukünftigen Tätigkeit als Hausarzt/Hausärztin auch sog. kleine Chirurgie[1] durchzuführen?	○	○	○	○	○

		keine				sehr gut
7	Wie schätzt du deine **Kompetenzen** in der **ambulanten** Versorgung chirurgischer Krankheitsbilder **insgesamt** ein?	○	○	○	○	○

	Wie schätzt du deine Kompetenzen ein, bei **Patienten mit Trauma** folgende Körperregionen zu **untersuchen**:	keine				sehr gut
8	Schultergelenk	○	○	○	○	○
9	Ellenbogengelenk	○	○	○	○	○
10	Handgelenk	○	○	○	○	○
11	Fingergelenke	○	○	○	○	○
12	Hüftgelenk	○	○	○	○	○
13	Kniegelenk	○	○	○	○	○
14	Sprunggelenke	○	○	○	○	○
15	Halswirbelsäule	○	○	○	○	○
16	Brustwirbelsäule	○	○	○	○	○
17	Lendenwirbelsäule	○	○	○	○	○

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	Beurteile deine **Kompetenzen** in:	**keine**				**sehr gut**
18	Einschätzung von Wundverhältnissen	○	○	○	○	○
19	Behandlung akuter Wunden	○	○	○	○	○
20	Behandlung chronischer Wunden	○	○	○	○	○
21	Behandlung infizierter Wunden	○	○	○	○	○
22	Versorgung von Frakturen **postoperativ**	○	○	○	○	○
23	Allgemeine Dokumentation von Verletzungen	○	○	○	○	○
24	Beurteilung notwendiger Impfungen bei Verletzungen	○	○	○	○	○
25	Kenntnis der Besonderheiten eines BG Falles	○	○	○	○	○
26	Verordnung von Hilfs- und Heilmitteln	○	○	○	○	○
27	Organisation ggf. notwendiger pflegerischer Versorgung zu Hause	○	○	○	○	○

	Wie schätzt du deine Kompetenzen in der **akuten Versorgung** folgender Krankheitsbilder hinsichtlich der **Einleitung einer adäquaten Therapie** ein?	**keine**				**sehr gut**
28	Prellungen	○	○	○	○	○
29	Distorsionen	○	○	○	○	○
30	Luxationen	○	○	○	○	○
31	Bissverletzungen	○	○	○	○	○
32	Fremdkörperverletzungen	○	○	○	○	○
33	Verbrennungen	○	○	○	○	○
34	Frakturen	○	○	○	○	○
35	Schädelhirntraumata	○	○	○	○	○
36	Verletzungen durch häusliche Gewalt	○	○	○	○	○

37	Hast du eine Rotation in die Chirurgie absolviert oder arbeitest aktuell in einer chirurgischen Fachabteilung?	☐ ja ☐ nein
37a	Wenn ja, in welcher/n chirurgische/n Fachabteilung/en warst bzw. bist du tätig? (Mehrfachnennung möglich)	☐ Orthopädie/ Unfallchirurgie ☐ Allgemein-/Viszeralchirurgie ☐ Thorax Chirurgie ☐ Herzchirurgie ☐ sonstiges (bitte Freitext nutzen)
	Freitext:	

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37b	Wenn ja, wo warst bzw. bist du chirurgisch tätig? (Mehrfachnennung möglich)	☐ stationär ☐ ambulant
37c	Wenn ja, wie lange warst du insgesamt chirurgisch tätig bzw. wirst du voraussichtlich tätig sein?	☐ bis 3 Monate ☐ 4-6 Monate ☐ 7-12 Monate ☐ mehr als 12 Monate

38	Für Quereinsteiger: Ich bin Facharzt in einer chirurgischen Disziplin	☐ ja ☐ nein
38a	Wenn ja, in welcher chirurg. Fachdisziplin?	*Freitext:*

39	Hast Du außerhalb des Studiums oder der Facharztweiterbildung chirurgische Erfahrungen gesammelt? (z.B. Rettungsdienst oder Pflegedienst)	☐ ja ☐ nein
39a	Wenn ja, wo hast du chirurgische Erfahrungen gesammelt?	*Freitext:*

40	Dein Geschlecht?	☐ w ☐ m ☐ divers	
41	Wann bist du geboren?	☐☐ /19☐☐	Monat/Jahr (z.B. 05/1986)
42	In welchem Jahr der Weiterbildung befindest du dich?	☐	(1 bis 5 Vollzeit-Äquivalent)
43	In welchem Weiterbildungsabschnitt befindest du dich?	☐ stationär ☐ ambulant	

Hast du noch Anmerkungen zu oder Vorschläge für den Fragebogen **Verletzungen in der hausärztlichen Praxis**?	*Freitext*

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COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item	Recommendation	
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	y
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	y
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	y
Objectives	3	State specific objectives, including any prespecified hypotheses	y
Methods			
Study design	4	Present key elements of study design early in the paper	y
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	y
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	y
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	n/a
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	y
Study size	10	Explain how the study size was arrived at	y
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	y
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	y
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	y
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	

		(*e*) Describe any sensitivity analyses	N/a

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	y
		(b) Give reasons for non-participation at each stage	y
		(c) Consider use of a flow diagram	y
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	y
		(b) Indicate number of participants with missing data for each variable of interest	y
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	y
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	*n/a*
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	*n/a*
		Cross-sectional study—Report numbers of outcome events or summary measures	*y*
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	n/a
		(*b*) Report category boundaries when continuous variables were categorized	n/a
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	y
Discussion			
Key results	18	Summarise key results with reference to study objectives	y
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	y
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	y
Generalisability	21	Discuss the generalisability (external validity) of the study results	y
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable	y

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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How can competencies in minor surgery in General Practice be increased? Assessing the effect of a compact-intervention in postgraduate training – a mixed methods study

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How can competencies in minor surgery in General Practice be increased? Assessing the effect of a compact-intervention in postgraduate training – a mixed methods study

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Abstract

Objectives: We aimed to assess General Practice trainees' self-perception of surgical competencies and to explore longitudinal effects of a compact-intervention.

Design: We performed a mixed-methods study including a before and after comparison in the intervention-group (=IG), a comparison of attendees and non-attendees (=control-group=CG) and a qualitative evaluation of the intervention. Competencies were self-assessed through surveys. Semi-structured interviews were performed after 9 months.

Setting: In 2019, a two-day voluntary seminar focussing on minor surgery/injuries was offered on 13 occasions by educators from KWBW Verbundweiterbildung^{plus} (*Competence Centre for Postgraduate Medical Education Baden-Württemberg)*.

Participants: All enrolled GP trainees were offered participation. GP trainees who did not attend a seminar (=non-attendees) were recruited for CG after the 13th intervention.

Intervention: Attendees took part in an interactive, GP-oriented short course incorporating 270 minutes of focussed minor surgery/injuries training (=compact intervention) on the second day of the two-day seminar.

Results: 326 GP trainees (IG: n=257; CG: n=69) participated in the study. 17 attendees were interviewed. CG had more often experienced a surgical rotation (p=.03) and reported higher interest in performing minor surgery in future practice (p=.03). GP trainees self-rated their all-round competency in minor surgery as average (IG: 3.0±1.0, CG: 3.2±0.9, IG:CG p=.06). After the intervention, attendees felt that surgical skills should be a core component of GP vocational training (p=.05). After 9 months, attendees remembered a variety of content and valued the interactive, case-oriented, peer-to-peer approach in a mixed learning-group. Some attendees reported they had started to overcome competency-gaps in minor surgery.

Conclusions: A compact intervention in minor surgery provides an 'intense' stimulus which could foster positive attitudes towards minor surgery and promote longitudinal personal development of related competencies in GP trainees, including those with little interest in surgery. Such measures appear crucial to support individual progress of GP trainees to provide comprehensive primary care.

Keywords: Postgraduate medical education, General Practice, Primary Care, Basic surgical skills, Minor Surgery, Compact Intervention

Strengths and limitations of this study

- The mixed-methods-approach including semi-structured interviews enabled a clear understanding of the effects of the compact-intervention.
- The longitudinal outcome of the intervention could be explored by the addition of semi-structured interviews 9 months after the intervention.
- A validated assessment of competencies could not be performed.
- Participation in the seminar was voluntary, risking selection bias.
- Randomisation was not applicable and recruitment to the control group took place after all GP trainees were offered the chance to participate.

1. Introduction

Primary healthcare, including General Practice (GP), aims to provide comprehensive, efficient and effective healthcare to everyone, everywhere (1). GP incorporates specific problem-solving skills as well as dealing with acute health problems such as injuries (2). To fulfil these tasks, General Practitioners (GPs) require specific competencies, including in "minor surgery". Competencies in medical education can be summarised as the *"knowledge, skills and attitudes required for the desired performance and behaviour"* (3). Minor surgery is defined as "*an operation on the superficial structures of the body or manipulative procedure that does not involve a serious risk"* (4). While identified as a necessary competency in GP, concerns of insufficient GP training in minor surgery are long standing (5) and persistent (6,7,8,9), particularly in countries without a robust primary care system (10,11). Within Germany there are variations in provision of minor surgery, including assessment and treatment of acute and chronic wounds, influenced by the physician's individual training and setting of the practice (urban/rural) (12,13).

Due to the wide breadth and specific requirements of GP, training programme directors have to decide on limits within the training curriculum. This is particularly pertinent for countries without a structured pedagogic programme, where vocational 'on the job' commitments restrict time for supplementary self-directed learning outside of clinical practice (14). However, even where GP training is clearly structured, such as in the UK, training in surgery is not a necessary component of the three-year training for GP (15).

In Germany, GP speciality training requires five years of postgraduate training, with mandatory rotations in internal medicine (12 months) and GP (24 months), in addition to 24 months of further training in other elective specialist rotations. Rotations in surgery are not mandatory. The first German postgraduate training programme in GP - the KWBW Verbundweiterbildung^{plus} *Competence Centre for Postgraduate Medical Education Baden-Württemberg* - aims to ensure basic competencies to help GP trainees master the challenges of primary care, including within rural areas. Since 2008, it offers a curriculum, seminar-programme, a structured mentoring-programme and regional clinical rotations across Baden-Württemberg as well as 'train-the-trainer' courses for educators (16,17).

GP trainees' attitudes towards and competency requirements for minor surgery have received little attention. This includes how basic surgical competencies could be ensured in a context of non-mandatory surgical rotations and limited annual time for a complementary programme during vocational training. In response to this, we designed a short training course (=compact intervention) on surgical competencies in our programme, specifically focussing on minor surgery/injuries in 2019. Educational compact interventions have shown to be feasible, effective and time-efficient means of fostering competencies of GP trainees in palliative care as well as self-care in the medium term (18,19). Based on this, we hypothesised that a compact intervention could be a useful approach to induce continuing competency development in minor surgery. Aims of this study were:

(1) to evaluate self-assessed competencies in basic surgery among GP trainees,

(2) to explore the effects of an educational compact intervention within a neglected clinical area,

(3) and to describe the longitudinal impact of the compact intervention.

2. Materials and Methods

2.1 Study design

The study examined GP trainees' confidence in basic surgical competencies in attendees and non-attendees of a training course in minor surgery, included a pre- and post-intervention survey among attendees as well as an exploration of impact 9 months post-intervention through semi-structured interviews.

2.2 Setting

All GP trainees enrolled in the KWBW Verbundweiterbildung*plus* were invited to participate in a two-day voluntary seminar focussing on minor surgery/injuries. All GP trainees were at some stage in their 5-year training, some with a previous surgical rotation. Participation in the two-day seminar was voluntary. A total of 13 two-day seminars were offered between January and December 2019. The seminars took place in seven different venues in Baden-Wuerttemberg, Germany. Participating GP trainees were invited to take part in the study (=intervention group, IG). Non-participating GP trainees (=non-attendees) were invited to the control group by email after the intervention period (=control group, CG).

2.3 Patient and Public Involvement

In 2018, the public was not involved in the planning of the study . Study tools were piloted with GPs and GP trainees during study planning.

2.4 Intervention

An interprofessional team of GP educators, practising GPs and nurses developed an educational compact intervention on minor surgery/injuries. In 2019, this compact intervention was integrated into the annual two-day training programme of the KWBW Verbundweiterbildung*plus*. The target number of participants was n=25 GP trainees per course. The main educational objective was to ensure participants gained the knowledge and skills required to treat patients presenting to GP with minor injuries. This included updating any previous surgical competencies. The hidden curriculum aimed to increase participants' self-efficacy and to establish a personal self-affirmation towards surgery. First the reasons for consulting were discussed (such as fall, bites, chronic wounds, head injuries) with the help of GP-oriented, case-based scenarios. This was followed by practical exercises, including trauma-management, suturing or bandaging. The session concluded with self-reflection and discussion on the implementation of minor surgery into daily GP-practice. The detailed course blueprint is presented as a supplementary file (Supplement 1).

2.5 Data collection

Attendees, including both GP trainees with, as well as without, a 6-month rotation in surgery, were asked to complete a paper-based questionnaire directly before (T1) and an online survey twelve weeks after the seminar (T2). Attendees were recruited to interview 9 months after the intervention period, recruiting both those with and without a previous rotation in surgery (T3). There was no financial incentive, we selected by voluntary response. Only attendees who had completed both surveys were eligible. Non-attendees were invited by e-mail to take part in a single online survey in March 2020 (T4). In the same e-mail we recruited for interviews. Only non-attendees who completed the survey were eligible. Data collection was completed in July 2020. Generally, those GP trainees included in planning of the study or with board-certification in a surgical speciality were excluded.

2.6 Measures and Outcomes (questionnaires)

Questionnaires developed by the study authors drawing on a comprehensive literature analysis, the Association for Medical Education in Europe (AMEE) guide 87 (20) and personal experience of medical training interventions were used (18,19) to assess study outcomes. Attendees as well as non-attendees rated 29 competencies in surgery using a five-point-Likert-scale (T1 and T4). Additional questions were added to the survey at T2 and for non-participants at T4 taking into consideration the different timepoints of data collection. All three versions of the questionnaire were piloted using a think-aloud technique with GPs and GP trainees before use (21). 5-point-Likert-Scale ranged from 1=none to 5=very good, 2-4 were not defined. Original surveys in German are provided as supplementary files (Supplement 2-4).

2.7 Interviews

Interviews were performed as semi-structured telephone interviews solely by a trained researcher with audio recording (SSte, MD, GP). The manual was developed by a team (n=4), whose members were familiar with the programme, the needs of the target learner-group and the current literature. The manual was piloted using think-aloud technique with two graduates from the programme with minor revisions before use. Main themes covered retrospective consideration of the intervention (including emotions) and its impact on the interviewees' current competencies in minor surgery.

2.8 Data analysis

2.8.1 Questionnaires

All quantitative data were analysed using the statistical programme SPSS (IBM Statistics, Version 25). Characteristics of GP trainees were summarised using descriptive statistics (absolute and relative frequencies (categorical variables), mean with standard deviation, and median with interquartile range (continuous variables)). Chi-square tests were used to detect differences in frequencies between the groups and Mann-Whitney U test for differences in rank

and continuous variables. Differences between T1 and T2 were analysed using t-tests for dependent samples and McNemar-tests. A STROBE-List is provided in the supplements (supplement 5).

2.8.2 Interviews

Interviews were transcribed verbatim (German). Data was analysed by three different researchers using the structured qualitative content-analysis approach of Kuckartz (22) and with the aid of MAX-QDA (VERBI GmbH, Berlin, Germany). All quotations in the manuscript were forward translated, with critical review and revision by a native English speaker fluent in German (AP; researcher in GP). A COREQ-List is provided in the supplements (supplement 6).

3. Results

In 2019, n=379 GP trainees participated in the curriculum of the KWBW Verbundweiterbildung*plus*. N=281 GP trainees attended one out of 13 independent two-day seminars including the intervention (mean n=21, range 15-31). GP trainees in the study team as well as those with a previous board-certification in a surgical field were excluded from participation (n=3 / n=15). The response rate for pre-intervention questionnaires at T1 was high (98%, n=257/263), decreasing for post-intervention questionnaires at T2 (response rate 53% n=135/257). Of 98 GP trainees invited to the control group, two third participated (response rate 70%, n=69/98). In total, 326 GP trainees (IG: n=257, CG: n=69; 86% of all GP trainees) participated in the study.

A total of 30 interviews were completed 9 months post-intervention. Mean interview duration was 27 minutes 54 seconds. (Minimum 14 minutes 9 seconds, Maximum 38 minutes 26 seconds). In the IG (n=17), 9 attendees had previous surgical experience (=rotation) compared with 8 who had not. In the non-attendees' group, 13 GP trainees participated in the interviews of which 6 had previous surgical experience (=rotation) compared with 7 who had not.

3.1 Sociodemographic data

Sociodemographic data for the IG and CG are presented in Table 1. 18.3% of IG (n=47) and 17.3% of CG (n=12) were older than 40 years. On average, the IG were in the fourth and CG in the fifth year of training (T1:CG, $p<0.01$). 34% of IG (n=89) and 49% of CG (n=34) had previously undertaken a rotation in surgery (p=0.03). Of those participating in the interviews, median age was 34.5 yrs. (Q1:33, Q3:35.75) and 73% were female (n=22, n=8 male). Mean duration of GP training was 3.8 yrs. (SD=0.83).

Table 1

Sociodemographic data and prior surgical experience of GP trainees (n=326)

		IG T1 (n=257)	IG T2 (n=135)	CG (n=69)	T1:CG (p)
Gender (n, %)	Female	187 (72.8%)	82 (60.7%)	57 (82.6%)	.08[1]
	Male	62 (24.1%)	18 (13.3%)	10 (14.5%)	
	Unknown	8 (3.1%)	35 (25.9%)	2 (2.9%)	
Age (in years)	**Md (Q1; Q3)**	**35 (32; 39)**	**34 (32; 39)**	**36 (34; 38)**	.08[2]
	Min-Max	27-62	27-60	28-52	
Year of training	Md (Q1; Q3)	4 (3; 5)	4 (3; 5)	5 (4; 5)	**<.01[2]**
	Min-Max	1-5	1-5	3-5	
Current rotation (n, %)	Outpatient / community or GP	204 (79.4%)	81 (60.0%)	61 (88.4%)	.12[1]
	Hospital	41 (16.0%)	17 (12.6%)	6 (8.7%)	
	Unknown	12 (4.7%)	37 (27.4%)	2 (2.9%)	
Are you currently undertaking or have completed a rotation in a surgical speciality?		Y 89 (34.6) N 163 (63.4) Unknown 5 (1.9)	Y 36 (26.7%) N 60 (44.4%) Unknown 39 (28.9%)	Y 34 (49.3) N 34 (49.3) Unknown 1 (1.4)	**.03[1]**
Have you gained surgical competencies outside of medical or postgraduate medical education (e.g., training as paramedic)?		Y 67 (26.1) N 175 (68.1) Unknown 15 (5.8)	Y 29 (21.5%) N 68 (50.4%) Unknown 38 (28.1%)	Y 15 (21.7) N 53 (76.8) Unknown 1 (1.4)	.35[1]

Note. GP=General Practice, T1: before intervention, T2: 12 weeks after intervention, IG= intervention group, CG=control group, p: p-value M: Mean, SD: Standard Deviation, Md: Median, Q1,Q3: interquartile range, [1]: chi-square (without "unknown" category), [2]: Mann-Whitney-U-Test

3.2 Self-assessed competencies (survey)

Table 2 depicts self-perceived competencies of GP trainees, with comparison of attendees (IG) and non-attendees (CG). GP trainees rated their all-round competency in the management of conditions requiring minor surgery within GP in the mid-range of a 5-point-Likert scale (maximum of 5) (IG at T1: 3.0±1.0, CG at T3: 3.2±0.9, IG:CG p=.06) [How do you estimate your all-round competencies in the treatment of surgical clinical pictures in General Practice?

Table 2

Tab.2 – Self-assessment of competencies in basic surgery of General Practice trainees (n=326)

	IG T1 (n=257)	CG (n=69)	IG T1:CG (p)
How competent do you feel at examining traumatic injury affecting the following parts of the body? (M, SD)			
Shoulder joint	3.1 (1.0) n=256	3.0 (0.9)	.40
Elbow joint	2.9 (1.0) n=256	2.9 (1.1)	.66
Wrist joint	3.1 (1.0) n=256	3.1 (1.0)	.93
Finger joints	3.3 (1.0) n=256	3.3 (1.0)	.98
Hip joint	3.4 (0.9) n=256	3.2 (1.0)	.11
Knee joint	3.5 (0.9) n=256	3.4 (1.0)	.35
Ankle joint	3.2 (1.0) n=256	3.2 (1.0)	.80
Cervical spine	3.0 (0.9) n=255	2.7 (1.1)	**.03**
Thoracic spine	3.1 (0.9) n=255	2.8 (1.0)	.01
Lumbar spine	3.2 (0.9) n=254	3.1 (1.0)	.22
Rate your competencies in… (M, SD)			
Assessment of wounds	3.5 (0.9)	3.8 (0.8) n=68	**.02**
Treatment of acute wounds	3.4 (1.0) n=255	3.7 (0.9) n=68	.10
Treatment of chronic wounds	3.0 (1.0)	3.3 (1.0) n=68	**<.01**
Treatment of infected wounds	2.9 (1.0) n=255	3.3 (1.0) n=68	**<.01**
Postoperative care of fractures	3.2 (1.1) n=255	3.3 (1.0) n=68	.55
General documentation of injuries	3.2 (1.0) n=256	3.5 (0.9) n=68	.07
Assessment of vaccination need after injuries	4.0 (0.9)	4.2 (0.8) n=68	.06
Knowledge of specific features of occupational injuries	2.9 (1.1) n=255	2.9 (1.2) n=68	.68
Instigating supports/splints and rehabilitation	2.7 (1.0)	2.8 (1.0) n=68	.41
Organisation of supportive care in the community	2.8 (1.0) n=254	2.8 (1.0) n=68	.80
How competent do you feel at initiating treatment in the following clinical presentations? (M, SD)			
Contusion	3.8 (0.9)	4.2 (0.8) n=68	**<.01**
Sprain	3.5 (1.1)	3.6 (1.1) n=68	.55
Luxation	2.7 (1.1)	2.5 (1.1) n=68	.32
Bite wounds	3.1 (1.1) n=256	3.3 (1.1) n=68	.10
Foreign bodies wounds	3.0 (1.0) n=254	3.1 (1.1) n=68	.60
Burns	3.0 (1.0)	3.1 (1.0) n=68	.47
Fracture	3.1 (1.0) n=256	3.0 (1.1) n=68	.58
Head and neck injury/trauma	3.0 (1.1) n=256	2.9 (1.1) n=68	.39
Domestic violence related injuries	2.6 (1.0) n=256	2.4 (1.1) n=68	.23

Note. GP: General Practice, T1: before intervention, T2: 10 weeks after intervention, IG= intervention group, CG=control group, p: p-value, M: Mean, SD: Standard Deviation, t-test, Likert scale (1-5, max.=5)

At T1, CG self-rated their competencies significantly better than IG in the assessment and treatment of acute and chronic wounds ($p=0.02$, $p<0.01$, $p<0.01$) as well as in initiating treatment in contusion ($p<0.01$). The IG rated their competencies significantly better in post-traumatic physical examination of cervical spine ($p=0.03$). Overall, despite assessment on

tetanus prevention and initiating treatment in contusion, both groups rated their competency in the mid-range.

3.3 Effects of the intervention (survey)

GP trainees' responses on the effects of the compact-intervention in basic surgery are also displayed in Table 3. After the training intervention, the IG rated their all-round competencies at 3.1±1.0 on a 5-point-Likert (T1:T2: p=.43). Interest in surgical presentations was

Table 3

Tab. 3 – Effects of a compact-intervention in basic surgery for GP trainees (n=326)

	IG T1 (n=257)	IG T2 (n=135)	CG (n=69)	IG T1: CG (p)	IG T1:T2 (p), n=100
How reasonable do you consider the following to be…					
A rotation in a surgical specialty during GP vocational training? (M, SD)	4.4 (0.8) n=256	4.4 (0.8)	4.2 (1.1)	.16	.68
A **mandatory** rotation in surgery during GP vocational training? (M, SD)	3.1 (1.3) n=256	3.3 (1.3)	3.9 (1.1)	**<.01**	**.05**
How would you rate your interest…?					
In surgery (in general)? (M, SD)	3.9 (0.9) n=255	3.9 (1.0)	3.7 (1.0)	.11	.30
In surgical presentations within General Practice ("minor surgery") (MD, SD)	4.1 (0.9) n=255	3.8 (1.1)	4.1 (1.1)	.97	**<.01**
In a GP-Practice rotation during vocational training which regularly offers "minor surgery"? (M, SD)	4.1 (1.0) n=256	4.1 (1.1)	4.4 (0.9)	**.03**	.09
In personally performing "minor surgery" in your future practice? (M, SD)	3.8 (1.2) n=255	3.7 (1.3)	4.1 (1.1)	**.03**	.57
As a result of the intervention, how highly would you rate your agreement with the following statements:					
I feel more confident in the treatment of patients with injuries.	n/a	3.2 (1.0)	n/a	n/a	n/a
I feel more competent in the treatment of patients with injuries.	n/a	3.1 (0.9)	n/a	n/a	n/a
I require direction from my GP-trainer on patients with injuries less often.	n/a	2.8 (1.0)	n/a	n/a	n/a
My interest in treating patients with injuries in GP has increased.	n/a	3.2 (1.1)	n/a	n/a	n/a

Note. GP: General Practice, T1: before intervention, T2: 10 weeks after intervention, IG= intervention group, CG=control group, p: p-value, M: Mean, SD: Standard Deviation, t-test, Likert scale: 1: very bad to 5: very good

lower after the training (p<0.01). At T2, GP trainees were more likely to agree that a surgical rotation should be a mandatory component of GP vocational training (p=.05). A non-responder analysis did not reveal any differences in the IG. At T1, the CG were already more likely to approve of a mandatory surgical rotation (3.9:3.1, p<0.01), interest in a rotation in a GP practice offering minor surgery (p=0.03) and interest in offering minor surgery in future practice (p=0.03) compared with IG.

3.4 Expectations and effects of the intervention (interviews)

Participant expectations are summarised as themes in Table 4. Both groups felt the compact intervention was relevant to routine GP. Participants expected the intervention to provide practice-oriented knowledge and skills, including structured procedures/algorithms on management within GP and when to refer to secondary care. Longitudinal, post-intervention codes were categorised into six categories (Table 5): part I summarizes *strengths of the intervention – general*, *strengths – peer to peer* and *weaknesses*; part II presents further categories (*content remembered, conclusion and impact on attitude and behaviour*).

Participants with and without previous surgical experience rated the mixed learning groups highly, feeling they helped to establish a positive peer-learning atmosphere.

> ***#18 (no rotation in surgery):*** *"Well, I liked it. Especially as a beginner, it was good to realise that the others haven't mastered everything; that there were colleagues who have worked for several years yet haven't done many surgical procedures."*
>
> ***#20 (2 yrs. In surgery):*** *"Well, I was really excited by the topic. Even though I didn't learn much new knowledge, the topic itself, while partly a repetition, got to the point on how it (minor surgery) could be and really is practiced in GP."*

#30 (6 mo. In surgery): *"Well I was heavily involved in surgery at that time and that is why it was a little redundant for me (...) it was enjoyable to do the exchange with those who have not done surgery in years, perhaps last time during medical school, and others who had more experience than me. To apply basic principles to GP was really good then."*

Table 4

Tab. 4 – Expectations of GP trainees on a compact-intervention in basic surgery/injuries (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Rating	No expectations	No expectations Low level of confidence in the topic. Promising title
Assessment of relevance	Relevant theme Common reason for GP consultation	Relevant for consultation in GP Relevant for personal training Challenge to implement surgery in GP
Exceptions with regards to content	Desire for structured procedural guidance and identification of red flags Desire for support in undertaking procedures independently Theoretical background / knowledge Wound dressing Wound management such as suturing or glue application Vaccination Postoperative organisation Postoperative analgesia	Desire for structured procedural guidance / algorithm Desire for support in undertaking procedures independently Desire for competencies Wound dressing

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, themes presented after qualitative content-analysis in regard to Kuckartz (22)

Participants were motivated to develop their surgical competencies, even if they previously had a negative attitude towards surgery:

#18 (no rotation in surgery): *"Yes, so it has shown me that basic surgical skills are really important for general practice. To be honest, I didn't really like surgery during medical school, but I did have a positive experience in the final year (of medical school), and this seminar has strengthened that (position), that it is really cool if you are able to do such things in the general practice by yourself, yes, certain things on your own. That was my impression, that I would absolutely want to reinforce*."

Furthermore, participants were motivated to improve their gaps in surgical competencies by addressing the issue, particularly through learning from peers. The intervention was a challenging but positive experience on the GP trainees' competencies.

#34 (no rotation in surgery): *"Yes, I had a bad feeling about wound management, I didn't know where to start. I recognised I really had to do something about this. That was what it provoked, it wasn't really a bad feeling in the end, but more that it was „good to have been confronted with that", that I have reflected on that, that I have to deal with minor surgery in GP, that I have to improve for my patients."*

#6 (no rotation in surgery): *"Well, I asked the medical staff (at my practice) and my trainer if I could be involved with the management of wounds, so that I just can see it. Yes, sometimes it works well and sometimes less so, because I also have consultations (with my own patients), but I felt that, ok somehow, I have somehow to gain greater experience and therefore also to organise (learning) situations, to at least have tried doing it.*

One beneficial aspect of the intervention was participant reflection and discussion on how minor surgery could be offered in routine GP. This included areas where it was seen as more (outside of cities) and less applicable (in urban areas with many surgeons and hospitals).

> ***#28 (6 mo. in surgery):*** *"Yes actually what is possible in GP (...) I think the lecturer mentioned that treatment of wounds in GP is becoming less frequent because it is not adequately financially reimbursed, and that you have to provide sterile materials and such things. But nevertheless, that he has shown what you can offer without having the arsenal of an emergency department to hand, which care you could provide. Yes, I really liked that, it gave me a realistic picture of what to expect in practice."*

3.5 Non-attendees (interviews)

Non-attendees were asked why they did not participate in the compact intervention, what could have enabled successful participation and what they had expected of the intervention. There were no differences in responses between those with and those without surgical experience. Reasons for non-attendance were: insufficient support from employers (no time for participation, no financial support), incompatibility of an overnight stay with family duties, not being in Germany at the time of intervention, and acute illness. Release and financial support from an individual's employer, the option to participate in the intervention in a one-day format, and provision of childcare would have supported participation. The non-attendees rated the intervention theme as both relevant and frequently utilisable within GP. Those unable to participate due to acute illness expressed regret at non-attendance, due to the perceived value of the topic, the collegial and positive atmosphere and the chance for peer-learning.

Table 5 (part I)

Tab. 5 part I –Longitudinal valuation of a compact-intervention on basic surgery/injuries after 9 months (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Strengths of the intervention - general	Alignment with the competence-based curriculum in General Practice	Case-based learning
	Gain in knowledge in comparison with the previous rotation (burns injuries)	Beneficial despite low level of personal competence in the topic
		Increased participants‘ self-efficacy
	Refresher	Focus on application in GP
	Procedural guidance (out-/in-patient). What can I do on my own / when do I admit to hospital?	Real-life cases from day-to-day GP
	Practical exercises – bandaging	Practical exercises – Oberst‘ conductive anaesthesia Practical exercises – physical examination of joints Suture practice Splinting after suspected fracture
	Educational methods – picture quiz	Educational methods – picture quiz Educational methods – group work
	Teaching aids – bandaging	Teaching aids – wound dressing
	Focus on application – how to perform minor surgery in practice	Interactive learning
		Comprehensive approach – post-fall injuries presenting alongside musculoskeletal trauma e.g. abdominal injury
		Lecturers (experienced GPs)
		Encouragement and increased self-confidence
Strengths of the intervention – peer to peer	Interactive learning and exchange with peers	Learning from peers Realisation of different levels of competence (motivating)
	To reflect on various management approaches	Collective learning enabled group work
	Exchange of experiences	Realisation of learning/competency gaps (due to comparison)
		Heterogeneity is beneficial
Weaknesses of the intervention	Reduced learning success without experience in GP practice	Reduced learning success without experience in GP practice Excessive pressures if in first year of training
	Skills redundant given previous surgical rotation	Too few practical exercises
	Skills in suture not necessary	Not enough training in suturing
	Not enough teaching on wound dressing	Not enough group works
	One lecturer expanded on emergency medicine too much (not relevant for GP)	Chronic wounds not part of the intervention

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, themes presented after qualitative content-analysis in regard to Kuckartz (22)

Table 5 (part II)

Tab. 5 part II – Longitudinal evaluation of a compact-intervention on basic surgery/injuries after 9 months (n=17)

Category	With surgical experience (n=9)	Without surgical experience (n=8)
Content remembered	Reflection and exchange on which level of minor surgery can be offered in General Practice	Many practical exercises / skills
	Practical exercises – suturing	Practice exercises – suturing
	Practice exercises – bandaging	Practical exercises – bandaging (compression bandage, Finger bandaging)
	Practical exercises – splinting	Practical exercises – physical examination of joints
	Picture quiz	Picture quiz
	Wound dressing	Wound management procedures in GP
	A challenge after 1 year	Burns injuries, ‚rule of palm‘
Conclusion	Very helpful for General Practice!	Very good and practice-oriented
	Very informative!	Good and informative!
	Outstanding!	Content way better than expected from the title
	Convenient	Very relevant
	I liked it	Group work - enabled getting to know colleagues
	Slightly boring	Stimulus to meet learning/competency needs
	Exchange of different opinions	Rapid overview
	Exciting despite some overlapping with previous surgical rotation	I can‘t remember
	Inspiration for GP (boost in motivation)	Now I can benefit from it
Impact on attitude and behaviour	Realisation that minor surgery by General Practitioners is mostly offered in “rural” areas	Intense stimulus to meet learning/competency gaps (during GP rotation)
		Established ways to develop competency (e.g. see as many patients with wounds as possible)
	Wish to offer minor surgery	Stimulus to apply for a rotation in surgical training (despite reservations against surgery)
	Regret that minor surgery in GP is only possible at a limited level	Work shadowing in surgery
		Rotation in surgery training
		Minor surgery in General Practice could be learned in rural GP Practices
		Realisation of learning/competency gaps (due to comparison with others) and realistic self-perception
		Approval of relevance of minor surgery in GP
		Increased wish to gain competencies in surgery
		Increasing wish to offer minor surgery in GP
		Wish for further future courses
		Frequent use of finger bandaging

Note. Semi-structured interviews with GP-trainees 9 months after the intervention, GP=General Practice, surgical experience = rotation in Surgery for 6 months or more, themes presented after qualitative content-analysis in regard to Kuckartz (22)

4. Discussion

To the best of our knowledge this is the first study to assess subjective competencies in basic surgical skills among GP trainees in Germany and to explore the effects of a compact intervention after 9 months. Due to the comparatively high number of participants, the study also represents a valuable addition to existing international studies. The aims of the study were met. We identified that GP trainees in Germany perceive their surgical competencies as average. We observed that attendees were less-likely to have a previous surgical rotation but favoured a mandatory surgical rotation for all GP trainees after the compact intervention. Interviews revealed that due to the intervention there could be a positive change of attitudes towards minor surgery in general, as well as a change in behaviour to overcome gaps in surgical competencies even among attendees not attracted by minor surgery.

The baseline surveys identified low self-efficacy and perceived insufficient training in minor surgery amongst current GP trainees in Germany. Early exposure to surgical skills supports medical students to establish a competency foundation which can be developed further during residency training (23). Nevertheless, continuity in training is valuable (7) and surgical skills form one component of broad primary care, a necessity in rural areas (13). We found that one third of the IG and half of the CG experienced a rotation in surgery during postgraduate medical education. Furthermore, the CG was more likely to search for a training post in GP with minor surgery and to perform minor surgery in future practice compared with the IG. We recognise that the intervention attracted GP trainees less interested in minor surgery.

After 12 weeks the compact intervention significantly changed GP trainees' attitudes towards a mandatory surgical rotation during GP speciality training. Conversely, attendees reported reduced interest in surgical presentations in GP as well as no increase in the attitude to perform

minor surgery in GP in future practice. We think that attendees gained a realistic understanding of minor surgery and became aware of their own competency gaps. We feel this likely led to them starting to favour a compulsory surgical rotation in GP training.

After 9 months, attendees described the advantages and disadvantages of the compact intervention as well as its effects in detail. The intervention was perceived as an intense but non-offensive stimulus to deal with personal competencies in minor surgery. Thereby, the compact intervention promoted GP trainees' longitudinal competency development. Educational compact interventions have been shown to be a feasible, effective and time-efficient means of fostering competencies of GP trainees in the short and mid-term (18,19, 24). This goes hand in hand with the learning-theory of Sagasser et al. (25), who postulated a short-time and long-time learning loop of GP trainees. The current compact intervention positively stimulated GP trainees' self-directed learning. This was likely achieved through creation of a positive attitude, goal setting and motivational encouragement to utilise competencies in practice. Boosting motivation appeared highly correlated with a positive learning atmosphere and re-affirmation of previous competencies. Motivation could even be described as prerequisite for learning in general (26).

The effective compact intervention of the present study included experienced GPs as lecturers, an interactive learner-oriented educational approach, a positive learning atmosphere, case-based scenarios and integration of the learner's daily life (practical approach). This study identified another effect of compact interventions: The peer-to-peer learning in a mixed learner's group turned out to be beneficial for two reasons: 1) participants intensified their learning by the peers' perspectives or being an instructor themselves, and 2) by comparing themselves with peers (comparison): '*If a peer can handle minor surgery in GP, I can also*

master it!'. Interviewees reported that peer-to-peer learning emblematised performance of minor surgery in GP as both feasible and necessary. However, whereas comparison appears appropriate, "real" competition should be avoided as it may negatively influence memory within learning processes (27).

In summary, the study was designed to explore the longitudinal changes after a compact-intervention and to meet the various natural limitations for educational interventions. The intervention increased GP trainees' motivation to address competency-gaps. In reference to a previous study on a compact intervention in another neglected field of primary care (end of life care) (18), the sequence of learning could be the following: Firstly, self-awareness of competency gaps in minor surgery, accompanied with skills and motivation to deal with them (=compact intervention in minor surgery, preferable in the first year of training). Then secondly, seeking for learning environments either in a surgical department, surgical practice or general practice, to gain competencies in minor surgery. As such, all GP trainees should ideally seek out practices which offer minor surgery.

Strengths and Limitations

To our knowledge, this is the first study to explore self-assessed competencies in basic surgery among GP trainees in Germany, as well as to longitudinally evaluate a compact intervention in minor surgery/injuries. We recognise that: firstly, participation was voluntary, meaning randomisation was not applicable and selection bias cannot be ruled out. Voluntary participation meant that dropout occurred between T1 and T2. Responder / non-responder analysis did not reveal any differences. Secondly, the extent to which other external factors may have influenced trainees' competency development after the intervention, including knowledge and skills in practice, is unclear. As such, quantifying the effects of the intervention must be

seen within a wider training and development context. This accounts for our extensive qualitative component within the mixed-methods study. As we followed an exploratory approach, we did not correct for multiple testing. This could have led to an over-estimation of the observed effects, especially since competencies are not independent of each other. Still, the observed group means show relevant differences. Thirdly, validated assessment of competencies (written and/or oral and/or practical such as directly observed procedures) could not be implemented. Fourthly, the intervention was performed face-to-face in 2019. Further research would be required to identify whether findings can be replicated using virtual training methods, for example online. Finally, GP trainees undertaking the KWBW Verbundweiterbildung*plus* training programme may have known each other prior to study commencement. This prior cohesiveness may have influenced the learning atmosphere and thereby fostered a gain in competencies (28).

Conclusion

A compact intervention in minor surgery as presented could induce changes in behaviour as well as learning even among those GP trainees with little interest in surgery (mind change). In doing so, it could help GP trainees to gain competencies in minor surgery and be empowered to offer comprehensive primary care. Further research is necessary to explore which organisational and reimbursement structures are required to ensure training of GP trainees and educators in minor surgery is sustainable and whether this translates into effective care provision.

Declarations

Competing interests

SSwl, DR, JSz and SSte were involved in the organisation of the training program KWBW Verbundweiterbildung*plus*. All authors declare no further competing interests.

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Abbreviation

CG	Control Group
GP	General Practice
GPs	General Practitioners
KWBW	*Kompetenzzentrum Weiterbildung Baden-Württemberg*
Verbundweiterbildung*plus*	(GERMAN) = Competence Centre for Postgraduate Medical Education Baden-Württemberg (Registered ®, German patent office, Munich, Germany)
IG	Intervention Group

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Author's contribution

SSwl contributed to conception and design of the study, to acquisition, analysis and interpretation of data and to drafting and revising the manuscript. KK contributed to design of the study, to analysis and interpretation of data and to revising the manuscript. AP contributed to analysis and interpretation of data and to drafting and revising the manuscript. DR contributed to acquisition and analysis of data and revising the manuscript. JSe contributed to interpretation of data and to revising the manuscript. JSz contributed to interpretation of data and to revising the manuscript. SSte contributed to design of the study, to acquisition, to analysis and to the interpretation of data and to drafting and revising the manuscript. All authors read and approved the final manuscript.

Data sharing statement

Data is available from the corresponding author (SSwl) at reasonable request. The original dataset is in German.

2.3 Ethics

The study was embedded into a larger cohort study and approved by the Ethics Committee of the University of Heidelberg (S570/2015). Participation in the study was voluntary and not incentivised. All participants provided signed informed consent.

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Figure 1

Blueprint: A compact intervention for General Practice Trainees aiming at the improvement of competencies in minor surgery				
Schedule	**Step**	**Aim**	**Methods**	**Tools and material**
Pre-interventional survey				
90 min.	**Minor surgery in General Practice – part 1** **"I have fallen down the stairs / I have cut myself"**	Introduction, reflection on personal level of competence Knowledge and how to do it: common algorithms on how to proceed with different consultations in general practice (e.g. fall, contusion, fracture, acute wounds, bites, foreign bodies), red flags as well as watchful waiting	Group discussion on previous knowledge and experience, lecture, case-based plenary discussions, group-work on cases	Survey on previous skills, presentation, chart request, print-out of cases /work sheets
30 min.	**Coffee break**			
90 min.	**Minor surgery in General Practice – part 2**	Procedural skills in bodycheck after fall, suturing and bandaging Awareness, knowledge and procedural understanding for domestic violence	Assessment of previous skills, practical exercise with exemplary body check, bandaging and suturing (suturing, bandaging extremities on each other) Plenary lecture, Group discussion	Pig-feet, sewing-materials, bandage, presentation, print-out of cases Presentation, work sheets
60 min.	**Lunch break**			
90 min.	**Minor surgery in General Practice – part 3**	Synthesis of comprehensive treatment (including vaccincation, referral to surgeon / hospital, further consultations) Self-reflection on how to proceed on increasing competenciens in minor surgery	Plenary lecture, Group discussion Case-based discussions Discussion on how to implement minor surgery into daily practice	Presentation, work sheets, flipchart

Note. GP = General Practice

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Verletzungen in der hausärztlichen Praxis

Selbsteinschätzungsbogen für Ärztinnen/Ärzte in Weiterbildung

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Bitte trage hier dein sechsstelliges Pseudonym ein.

Erster Buchstabe des Vornamens deiner Mutter	Zweiter Buchstabe des Vornamens deiner Mutter	Erster Buchstabe deines Geburtsorts	Zweiter Buchstabe deines Geburtsorts	Tageszahl deines Geburtstages (z.B. 7. Oktober 1984 = 07)	
1	2	3	3b	4	5

Liebe Ärztinnen und Ärzte in Weiterbildung,
bitte gebt in den folgenden Antwortmöglichkeiten an, wie ihr eure **Kompetenzen in der Versorgung von Patienten mit Verletzungen in der hausärztlichen Praxis bzw. in der Organisation der weiteren Versorgung** (z.B. Einweisung in eine Klinik) selbst einschätzt. **Vielen Dank für eure Teilnahme!**

[1]Vorab: **Begriffsdefinition „Kleine Chirurgie“:** Kleinchirurgische Eingriffe wie z.B. Abszess-Eröffnung oder primäre Wundversorgung mittels Naht

	Als wie **sinnvoll** erachtest du…	Gar nicht sinnvoll				sehr sinnvoll
1	eine Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
2	eine **verpflichtende** Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
	Als wie hoch würdest du dein **Interesse** bezeichnen…	Gar kein				sehr hoch
3	an chirurgischen Inhalten (**allgemein**)?	○	○	○	○	○
4	an chirurgischen Inhalten **in der Hausarztpraxis** (sog. kleine Chirurgie[1])?	○	○	○	○	○
5	deine Weiterbildung in einer Hausarztpraxis zu absolvieren, in der regelmäßig kleine Chirurgie[1] durchführt wird?	○	○	○	○	○
6	selbst in deiner zukünftigen Tätigkeit als Hausarzt/Hausärztin auch sog. kleine Chirurgie[1] durchzuführen?	○	○	○	○	○

7	Wie schätzt du deine **Kompetenzen** in der **ambulanten** Versorgung chirurgischer Krankheitsbilder **insgesamt** ein?	keine ○	○	○	○	sehr gut ○

	Wie schätzt du deine Kompetenzen ein, bei **Patienten mit Trauma** folgende Körperregionen zu **untersuchen**:	keine				sehr gut
8	Schultergelenk	○	○	○	○	○
9	Ellenbogengelenk	○	○	○	○	○
10	Handgelenk	○	○	○	○	○
11	Fingergelenke	○	○	○	○	○
12	Hüftgelenk	○	○	○	○	○
13	Kniegelenk	○	○	○	○	○
14	Sprunggelenke	○	○	○	○	○
15	Halswirbelsäule	○	○	○	○	○
16	Brustwirbelsäule	○	○	○	○	○
17	Lendenwirbelsäule	○	○	○	○	○

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	Beurteile deine **Kompetenzen** in:	**keine**				**sehr gut**
18	Einschätzung von Wundverhältnissen	○	○	○	○	○
19	Behandlung akuter Wunden	○	○	○	○	○
20	Behandlung chronischer Wunden	○	○	○	○	○
21	Behandlung infizierter Wunden	○	○	○	○	○
22	Versorgung von Frakturen **postoperativ**	○	○	○	○	○
23	Allgemeine Dokumentation von Verletzungen	○	○	○	○	○
24	Beurteilung notwendiger Impfungen bei Verletzungen	○	○	○	○	○
25	Kenntnis der Besonderheiten eines BG Falles	○	○	○	○	○
26	Verordnung von Hilfs- und Heilmitteln	○	○	○	○	○
27	Organisation ggf. notwendiger pflegerischer Versorgung zu Hause	○	○	○	○	○

	Wie schätzt du deine Kompetenzen in der **akuten Versorgung** folgender Krankheitsbilder hinsichtlich der **Einleitung einer adäquaten Therapie** ein?	**keine**				**sehr gut**
28	Prellungen	○	○	○	○	○
29	Distorsionen	○	○	○	○	○
30	Luxationen	○	○	○	○	○
31	Bissverletzungen	○	○	○	○	○
32	Fremdkörperverletzungen	○	○	○	○	○
33	Verbrennungen	○	○	○	○	○
34	Frakturen	○	○	○	○	○
35	Schädelhirntraumata	○	○	○	○	○
36	Verletzungen durch häusliche Gewalt	○	○	○	○	○

37	Hast du eine Rotation in die Chirurgie absolviert oder arbeitest aktuell in einer chirurgischen Fachabteilung?	☐ ja ☐ nein
37a	Wenn ja, in welcher/n chirurgische/n Fachabteilung/en warst bzw. bist du tätig? (Mehrfachnennung möglich)	☐ Orthopädie/ Unfallchirurgie ☐ Allgemein-/Viszeralchirurgie ☐ Thorax Chirurgie ☐ Herzchirurgie ☐ sonstiges (bitte Freitext nutzen)
	Freitext:	
37b	Wenn ja, wo warst bzw. bist du chirurgisch tätig? (Mehrfachnennung möglich)	☐ stationär ☐ ambulant
37c	Wenn ja, wie lange warst du insgesamt chirurgisch tätig bzw. wirst du voraussichtlich tätig sein?	☐ bis 3 Monate ☐ 4-6 Monate ☐ 7-12 Monate ☐ mehr als 12 Monate

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38	Für Quereinsteiger: Ich bin Facharzt in einer chirurgischen Disziplin	☐ ja ☐ nein
38a	Wenn ja, in welcher chirurg. Fachdisziplin?	*Freitext:*

39	Hast Du außerhalb des Studiums oder der Facharztweiterbildung chirurgische Erfahrungen gesammelt? (z.B. Rettungsdienst oder Pflegedienst)	☐ ja ☐ nein
39a	Wenn ja, wo hast du chirurgische Erfahrungen gesammelt?	*Freitext:*

40	Dein Geschlecht?	☐ w ☐ m ☐ divers	
41	Wann bist du geboren?	☐☐ /19☐☐	Monat/Jahr (z.B. 05/1986)
42	In welchem Jahr der Weiterbildung befindest du dich?	☐	(1 bis 5 Vollzeit-Äquivalent)
43	In welchem Weiterbildungsabschnitt befindest du dich?	☐ stationär ☐ ambulant	

Hast du noch Anmerkungen zu oder Vorschläge für den Fragebogen **Verletzungen in der hausärztlichen Praxis**?	*Freitext*

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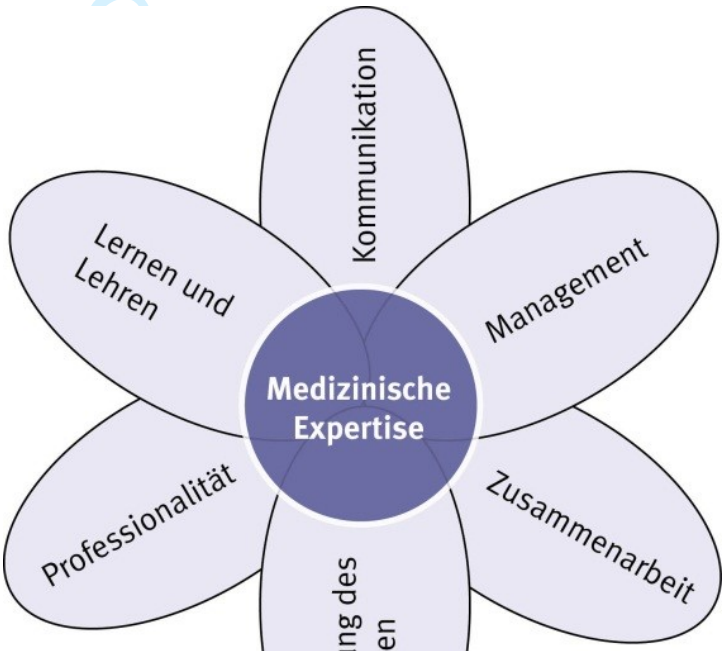
NACHBEFRAGUNG Verletzungen in der hausärztlichen Praxis

Selbsteinschätzungsbogen für Ärztinnen/Ärzte in Weiterbildung



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1	2	3	3b	4	5

Liebe Ärztinnen und Ärzte in Weiterbildung,
bitte gebt in den folgenden Antwortmöglichkeiten an, wie ihr eure **Kompetenzen in der Versorgung von Patienten mit Verletzungen in der hausärztlichen Praxis bzw. in der Organisation der weiteren Versorgung** (z.B. Einweisung in eine Klinik) selbst einschätzt. **Vielen Dank für eure Teilnahme!**

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	Als wie **sinnvoll** erachtest du…	Gar nicht sinnvoll				sehr sinnvoll
1	eine Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
2	eine **verpflichtende** Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
	Als wie hoch würdest du dein **Interesse** bezeichnen…	**Gar kein**				**sehr hoch**
3	an chirurgischen Inhalten (**allgemein**)?	○	○	○	○	○
4	an chirurgischen Inhalten **in der Hausarztpraxis** (sog. kleine Chirurgie[1])?	○	○	○	○	○
5	deine Weiterbildung in einer Hausarztpraxis zu absolvieren, in der regelmäßig kleine Chirurgie[1] durchführt wird?	○	○	○	○	○
6	selbst in deiner zukünftigen Tätigkeit als Hausarzt/Hausärztin auch sog. kleine Chirurgie[1] durchzuführen?	○	○	○	○	○

7	Wie schätzt du deine **Kompetenzen** in der **ambulanten** Versorgung chirurgischer Krankheitsbilder **insgesamt** ein?	**keine** ○	○	○	○	**sehr gut** ○

Als wie hoch würdest du deine **Zustimmung** zu folgenden Aussagen bewerten? **Durch den Doppelseminartag 2019…**		**Gar keine**				**sehr hoch**
8	…fühle ich mich **sicherer** in der Versorgung von Patienten mit Verletzungen.	○	○	○	○	○
9	…fühle ich mich **kompetenter** in der Versorgung von Patienten mit Verletzungen.	○	○	○	○	○
10	…versorge ich Patienten mit Verletzungen **eher selbst**.	○	○	○	○	○
11	…halte ich bei Patienten mit Verletzungen **seltener Rücksprache** mit meinem Weiterbilder / meiner Weiterbilderin.	○	○	○	○	○
12	…hat sich **mein Interesse** für die **Versorgung von Verletzungen** in der Hausarztpraxis gesteigert.	○	○	○	○	○
13	…hat sich **mein allgemeines chirurgisches Interesse** gesteigert.	○	○	○	○	○

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14	Als wie wichtig erachtest du Seminare mit chirurgischen Inhalten innerhalb der ärztlichen Weiterbildung für Allgemeinmedizin?	**Sehr unwichtig** ○ ○ ○ ○ ○ **sehr wichtig**

15	Was hättest du dir im Seminar noch gewünscht?	
	Freitext (stichwortartig)	

16	Hast du seit dem Doppelseminartag eine Rotation in einem chirurgischen Fach begonnen?	☐ ja ☐ nein

Hast du noch Anmerkungen?	*Freitext*

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Verletzungen in der hausärztlichen Praxis

Selbsteinschätzungsbogen für Ärztinnen/Ärzte in Weiterbildung

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2	eine **verpflichtende** Rotation in einem chirurgischen Fach in der Weiterbildung zum Facharzt Allgemeinmedizin?	○	○	○	○	○
	Als wie hoch würdest du dein **Interesse** bezeichnen…	Gar kein				sehr hoch
3	an chirurgischen Inhalten (**allgemein**)?	○	○	○	○	○
4	an chirurgischen Inhalten **in der Hausarztpraxis** (sog. kleine Chirurgie[1])?	○	○	○	○	○
5	deine Weiterbildung in einer Hausarztpraxis zu absolvieren, in der regelmäßig kleine Chirurgie[1] durchführt wird?	○	○	○	○	○
6	selbst in deiner zukünftigen Tätigkeit als Hausarzt/Hausärztin auch sog. kleine Chirurgie[1] durchzuführen?	○	○	○	○	○

		keine				sehr gut
7	Wie schätzt du deine **Kompetenzen** in der **ambulanten** Versorgung chirurgischer Krankheitsbilder **insgesamt** ein?	○	○	○	○	○

	Wie schätzt du deine Kompetenzen ein, bei **Patienten mit Trauma** folgende Körperregionen zu **untersuchen**:	keine				sehr gut
8	Schultergelenk	○	○	○	○	○
9	Ellenbogengelenk	○	○	○	○	○
10	Handgelenk	○	○	○	○	○
11	Fingergelenke	○	○	○	○	○
12	Hüftgelenk	○	○	○	○	○
13	Kniegelenk	○	○	○	○	○
14	Sprunggelenke	○	○	○	○	○
15	Halswirbelsäule	○	○	○	○	○
16	Brustwirbelsäule	○	○	○	○	○
17	Lendenwirbelsäule	○	○	○	○	○

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	Beurteile deine **Kompetenzen** in:	**keine**				**sehr gut**
18	Einschätzung von Wundverhältnissen	○	○	○	○	○
19	Behandlung akuter Wunden	○	○	○	○	○
20	Behandlung chronischer Wunden	○	○	○	○	○
21	Behandlung infizierter Wunden	○	○	○	○	○
22	Versorgung von Frakturen **postoperativ**	○	○	○	○	○
23	Allgemeine Dokumentation von Verletzungen	○	○	○	○	○
24	Beurteilung notwendiger Impfungen bei Verletzungen	○	○	○	○	○
25	Kenntnis der Besonderheiten eines BG Falles	○	○	○	○	○
26	Verordnung von Hilfs- und Heilmitteln	○	○	○	○	○
27	Organisation ggf. notwendiger pflegerischer Versorgung zu Hause	○	○	○	○	○

	Wie schätzt du deine Kompetenzen in der **akuten Versorgung** folgender Krankheitsbilder hinsichtlich der **Einleitung einer adäquaten Therapie** ein?	**keine**				**sehr gut**
28	Prellungen	○	○	○	○	○
29	Distorsionen	○	○	○	○	○
30	Luxationen	○	○	○	○	○
31	Bissverletzungen	○	○	○	○	○
32	Fremdkörperverletzungen	○	○	○	○	○
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35	Schädelhirntraumata	○	○	○	○	○
36	Verletzungen durch häusliche Gewalt	○	○	○	○	○

37	Hast du eine Rotation in die Chirurgie absolviert oder arbeitest aktuell in einer chirurgischen Fachabteilung?	☐ ja ☐ nein
37a	Wenn ja, in welcher/n chirurgische/n Fachabteilung/en warst bzw. bist du tätig? (Mehrfachnennung möglich)	☐ Orthopädie/ Unfallchirurgie ☐ Allgemein-/Viszeralchirurgie ☐ Thorax Chirurgie ☐ Herzchirurgie ☐ sonstiges (bitte Freitext nutzen)
	Freitext:	

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37b	Wenn ja, wo warst bzw. bist du chirurgisch tätig? (Mehrfachnennung möglich)	☐ stationär ☐ ambulant
37c	Wenn ja, wie lange warst du insgesamt chirurgisch tätig bzw. wirst du voraussichtlich tätig sein?	☐ bis 3 Monate ☐ 4-6 Monate ☐ 7-12 Monate ☐ mehr als 12 Monate

38	Für Quereinsteiger: Ich bin Facharzt in einer chirurgischen Disziplin	☐ ja ☐ nein
38a	Wenn ja, in welcher chirurg. Fachdisziplin?	*Freitext:*

39	Hast Du außerhalb des Studiums oder der Facharztweiterbildung chirurgische Erfahrungen gesammelt? (z.B. Rettungsdienst oder Pflegedienst)	☐ ja ☐ nein
39a	Wenn ja, wo hast du chirurgische Erfahrungen gesammelt?	*Freitext:*

40	Dein Geschlecht?	☐ w ☐ m ☐ divers	
41	Wann bist du geboren?	☐☐ /19☐☐	Monat/Jahr (z.B. 05/1986)
42	In welchem Jahr der Weiterbildung befindest du dich?	☐	(1 bis 5 Vollzeit-Äquivalent)
43	In welchem Weiterbildungsabschnitt befindest du dich?	☐ stationär ☐ ambulant	

Hast du noch Anmerkungen zu oder Vorschläge für den Fragebogen **Verletzungen in der hausärztlichen Praxis**?	*Freitext*

UniversitätsKlinikum Heidelberg

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item	Recommendation	
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	y
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	y
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	y
Objectives	3	State specific objectives, including any prespecified hypotheses	y
Methods			
Study design	4	Present key elements of study design early in the paper	y
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	y
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	y
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	y
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	y
Study size	10	Explain how the study size was arrived at	y
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	y
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	y
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	y
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	

		(*e*) Describe any sensitivity analyses	N/a

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	y
		(b) Give reasons for non-participation at each stage	y
		(c) Consider use of a flow diagram	y
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	y
		(b) Indicate number of participants with missing data for each variable of interest	y
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	y
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	*y*
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	*n/a*
		Cross-sectional study—Report numbers of outcome events or summary measures	*y*
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	n/a
		(*b*) Report category boundaries when continuous variables were categorized	n/a
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	y
Discussion			
Key results	18	Summarise key results with reference to study objectives	y
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	y
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	y
Generalisability	21	Discuss the generalisability (external validity) of the study results	y
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable	y

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

COREQ (COnsolidated criteria for REporting Qualitative research) Checklist

A checklist of items that should be included in reports of qualitative research. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Topic	Item No.	Guide Questions/Description	Reported on Page No.
Domain 1: Research team and reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	
Credentials	2	What were the researcher's credentials? E.g. PhD, MD	
Occupation	3	What was their occupation at the time of the study?	
Gender	4	Was the researcher male or female?	
Experience and training	5	What experience or training did the researcher have?	
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	
Participant knowledge of the interviewer	7	What did the participants know about the researcher? e.g. personal goals, reasons for doing the research	
Interviewer characteristics	8	What characteristics were reported about the inter viewer/facilitator? e.g. Bias, assumptions, reasons and interests in the research topic	
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was stated to underpin the study? e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	
Participant selection			
Sampling	10	How were participants selected? e.g. purposive, convenience, consecutive, snowball	
Method of approach	11	How were participants approached? e.g. face-to-face, telephone, mail, email	
Sample size	12	How many participants were in the study?	
Non-participation	13	How many people refused to participate or dropped out? Reasons?	
Setting			
Setting of data collection	14	Where was the data collected? e.g. home, clinic, workplace	
Presence of non-participants	15	Was anyone else present besides the participants and researchers?	
Description of sample	16	What are the important characteristics of the sample? e.g. demographic data, date	
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	
Repeat interviews	18	Were repeat inter views carried out? If yes, how many?	
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	
Field notes	20	Were field notes made during and/or after the inter view or focus group?	
Duration	21	What was the duration of the inter views or focus group?	
Data saturation	22	Was data saturation discussed?	
Transcripts returned	23	Were transcripts returned to participants for comment and/or	

Topic	Item No.	Guide Questions/Description	Reported on Page No.
		correction?	
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	
Description of the coding tree	25	Did authors provide a description of the coding tree?	
Derivation of themes	26	Were themes identified in advance or derived from the data?	
Software	27	What software, if applicable, was used to manage the data?	
Participant checking	28	Did participants provide feedback on the findings?	
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? e.g. participant number	
Data and findings consistent	30	Was there consistency between the data presented and the findings?	
Clarity of major themes	31	Were major themes clearly presented in the findings?	
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care*. 2007. Volume 19, Number 6: pp. 349 – 357

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.