


# BMJ Open 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 (GP) 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 2-day voluntary seminar focussing on minor surgery/injuries was offered on 13 occasions by educators from KWBW Verbundweiterbildung<sup>plus</sup> (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 min of focused minor surgery/injuries training (compact intervention) on the second day of the 2-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=0.03) and reported higher interest in performing minor surgery in future practice (p=0.03). 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=0.06). After the intervention, attendees felt that surgical skills should be a core component of GP vocational training (p=0.05). 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

## 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 general practice trainees were offered the chance to participate.

progress of GP trainees to provide comprehensive primary care.

## INTRODUCTION

Primary healthcare, including general practice (GP), aims to provide comprehensive, efficient and effective healthcare to everyone, everywhere.<sup>1</sup> GP incorporates specific problem-solving skills as well as dealing with acute health problems such as injuries.<sup>2</sup> 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'.<sup>3</sup> Minor surgery is defined as 'an operation on the superficial structures of the body or manipulative procedure that does not involve a serious risk'.<sup>4</sup> While identified as a necessary competency in GP, concerns of insufficient GP training in minor surgery are long standing<sup>5</sup> and persistent,<sup>6-9</sup> particularly in countries without a robust primary care system.<sup>10 11</sup> 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).<sup>12 13</sup>

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.<sup>14</sup> However, even where GP training is clearly structured, such as in the UK, training in surgery is not a necessary component of the 3-year training for GP.<sup>15</sup>

In Germany, GP specialty training requires 5 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<sup>plus</sup> *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.<sup>16 17</sup>

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.<sup>18 19</sup> 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. to describe the longitudinal impact of the compact intervention.

## MATERIALS AND METHODS

### 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-intervention and post-intervention survey among attendees as well as an exploration of impact 9 months post-intervention through semi-structured interviews.

### Setting

All GP trainees enrolled in the KWBW Verbundweiterbildung<sup>plus</sup> were invited to participate in a 2-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 2-day seminar was voluntary. A total of 13 2-day seminars were offered between January and December 2019. The seminars took place in seven different venues in Baden-Württemberg, 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)).

### 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.

### 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 2-day training programme of the KWBW Verbundweiterbildung<sup>plus</sup>. 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 in online supplemental file 1.

### 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 12 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 email to take part in a single online survey in March 2020 (T4). In the same

email 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 specialty were excluded.

### Measures and outcomes (questionnaires)

Questionnaires developed by the study authors drawing on a comprehensive literature analysis, the Association for Medical Education in Europe guide 87<sup>20</sup> and personal experience of medical training interventions were used<sup>18 19</sup> to assess study outcomes. Attendees as well as non-attendees rated 29 competencies in surgery using a 5-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.<sup>21</sup> The 5-point Likert scale ranged from 1=none to 5=verygood, 2–4 were not defined. Original surveys in German are provided in online supplemental files 2–4.

### Interviews

Interviews were performed as semi-structured telephone interviews solely by a trained researcher with audio recording (SSt, 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.

### Data analysis

#### Questionnaires

All quantitative data were analysed using the statistical programme SPSS (IBM Statistics, V.25). Characteristics of GP trainees were summarised using descriptive statistics (absolute and relative frequencies (categorical variables), mean with SD and median with IQR (continuous variables));  $\chi^2$  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 Strengthening the Reporting of Observational Studies in Epidemiology list is provided in online supplemental file 5.

### Interviews

Interviews were transcribed verbatim (German). Data were analysed by three different researchers using the structured qualitative content-analysis approach of Kuckartz<sup>22</sup> and with the aid of MAX-QDA (VERBI, 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 Consolidated criteria for Reporting Qualitative research list is provided in online supplemental file 6.

## RESULTS

In 2019, n=379 GP trainees participated in the curriculum of the KWBW Verbundweiterbildung<sup>plus</sup>. A total of 281 GP trainees attended 1 out of 13 independent 2-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 min 54 s (minimum 14 min 9 s, maximum 38 min 26 s). In the IG (n=17), nine attendees had previous surgical experience (rotation) compared with eight 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.

### 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). Thirty-four per cent 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 years (Q1: 33, Q3: 35.75) and 73% were female (n=22, n=8 male). Mean duration of GP training was 3.8 years (SD=0.83).

### 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=0.06) (How do you estimate your all-round competencies in the treatment of surgical clinical pictures in general practice?)

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



**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 value)
Gender (n, %)	Female	187 (72.8%)	82 (60.7%)	57 (82.6%)	0.08*
	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)	0.08†
	Min–Max	27–62	27–60	28–52	
Year of training	Md (Q1; Q3)	4 (3; 5)	4 (3; 5)	5 (4; 5)	<0.01†
	Min–Max	1 May	1 May	3 May	
Current rotation (n, %)	Outpatient/Community or GP	204 (79.4%)	81 (60.0%)	61 (88.4%)	0.12*
	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 specialty?	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)	0.03*	
Have you gained surgical competencies outside of medical or postgraduate medical education (eg, 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)	0.35*	

\* $\chi^2$  (without 'unknown' category).

†Mann-Whitney U test.

CG, control group; GP, general practice; IG, intervention group; M, mean; Md, median; Q1, Q3, IQR; T1, before intervention; T2, 12 weeks after intervention.

treatment in contusion, both groups rated their competency in the mid-range.

### 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 scale (T1:T2: p=0.43). Interest in surgical presentations was 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.

### 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 summarises

*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 years 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 months 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:

**Table 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 value)
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)	0.40
Elbow joint	2.9 (1.0) n=256	2.9 (1.1)	0.66
Wrist joint	3.1 (1.0) n=256	3.1 (1.0)	0.93
Finger joints	3.3 (1.0) n=256	3.3 (1.0)	0.98
Hip joint	3.4 (0.9) n=256	3.2 (1.0)	0.11
Knee joint	3.5 (0.9) n=256	3.4 (1.0)	0.35
Ankle joint	3.2 (1.0) n=256	3.2 (1.0)	0.80
Cervical spine	3.0 (0.9) n=255	2.7 (1.1)	0.03
Thoracic spine	3.1 (0.9) n=255	2.8 (1.0)	0.01
Lumbar spine	3.2 (0.9) n=254	3.1 (1.0)	0.22
Rate your competencies in... (M, SD)			
Assessment of wounds	3.5 (0.9)	3.8 (0.8) n=68	0.02
Treatment of acute wounds	3.4 (1.0) n=255	3.7 (0.9) n=68	0.10
Treatment of chronic wounds	3.0 (1.0)	3.3 (1.0) n=68	<0.01
Treatment of infected wounds	2.9 (1.0) n=255	3.3 (1.0) n=68	<0.01
Postoperative care of fractures	3.2 (1.1) n=255	3.3 (1.0) n=68	0.55
General documentation of injuries	3.2 (1.0) n=256	3.5 (0.9) n=68	0.07
Assessment of vaccination need after injuries	4.0 (0.9)	4.2 (0.8) n=68	0.06
Knowledge of specific features of occupational injuries	2.9 (1.1) n=255	2.9 (1.2) n=68	0.68
Instigating supports/splints and rehabilitation	2.7 (1.0)	2.8 (1.0) n=68	0.41
Organisation of supportive care in the community	2.8 (1.0) n=254	2.8 (1.0) n=68	0.80
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	<0.01
Sprain	3.5 (1.1)	3.6 (1.1) n=68	0.55
Luxation	2.7 (1.1)	2.5 (1.1) n=68	0.32
Bite wounds	3.1 (1.1) n=256	3.3 (1.1) n=68	0.10
Foreign bodies wounds	3.0 (1.0) n=254	3.1 (1.1) n=68	0.60
Burns	3.0 (1.0)	3.1 (1.0) n=68	0.47
Fracture	3.1 (1.0) n=256	3.0 (1.1) n=68	0.58
Head and neck injury/trauma	3.0 (1.1) n=256	2.9 (1.1) n=68	0.39
Domestic violence-related injuries	2.6 (1.0) n=256	2.4 (1.1) n=68	0.23

T-test, Likert scale (1–5, max=5).  
 CG, control group; GP, general practice; IG, intervention group; M, mean; T1, before intervention; T2, 10 weeks after intervention.

**#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

**Table 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 value)	IG T1:T2 (p value), 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)	0.16	0.68
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)	<0.01	0.05
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)	0.11	0.30
In surgical presentations within general practice ('minor surgery') (MD, SD)	4.1 (0.9) n=255	3.8 (1.1)	4.1 (1.1)	0.97	<0.01
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)	0.03	0.09
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)	0.03	0.57
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

T-test, Likert scale: 1: very bad to 5: very good.  
CG, control group; GP, general practice; IG, intervention group; M, mean; n/a, not available; T1, before intervention; T2, 10 weeks after intervention.

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 months 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.

### 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 1 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.

### 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

**Table 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	Relevant for consultation in GP
	Common reason for GP consultation	Relevant for personal training
		Challenge to implement surgery in GP
Exceptions with regard 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	

Semi-structured interviews with GP trainees 9 months after the intervention. Surgical experience=rotation in surgery for 6 months or more, themes presented after qualitative content-analysis approach of Kuckartz.<sup>22</sup>  
GP, general practice.

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 among 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.<sup>23</sup> Nevertheless, continuity in training is valuable<sup>7</sup> and surgical skills form one component of broad primary care, a necessity in rural areas.<sup>13</sup> 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 specialty 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.<sup>18 19 24</sup> This goes hand in hand with the learning theory of Sagasser *et al*,<sup>25</sup> 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 use 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.<sup>26</sup>

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

**Table 5** Longitudinal evaluation of a compact intervention on basic surgery/injuries after 9 months (n=17)

Part I: longitudinal evaluation of a compact intervention on basic surgery/injuries after 9 months (n=17)	
Category	Without surgical experience (n=8)
Strengths of the intervention— general	Case-based learning Beneficial despite low level of personal competence in the topic Increased participants' self-efficacy Focus on application in GP Real-life cases from day-to-day GP
	Practical exercises—Oberst' conductive anaesthesia Practical exercises—physical examination of joints Suture practice Splinting after suspected fracture Educational methods—picture quiz Educational methods—group work Teaching aids—wound dressing Interactive learning Comprehensive approach—postfall injuries presenting alongside musculoskeletal trauma, for example, abdominal injury Lecturers (experienced GPs) Encouragement and increased self-confidence Learning from peers Realisation of different levels of competence (motivating) Collective learning enabled group work Realisation of learning/competency gaps (due to comparison) Heterogeneity is beneficial Reduced learning success without experience in GP practice Excessive pressures if in first year of training Too few practical exercises Not enough training in suturing Not enough group works Chronic wounds not part of the intervention
	Practical exercises—bandaging Educational methods—picture quiz Teaching aids—bandaging Focus on application—how to perform minor surgery in practice
Strengths of the intervention—peer to peer	Interactive learning and exchange with peers
	To reflect on various management approaches Exchange of experiences Reduced learning success without experience in GP practice Skills redundant given previous surgical rotation Skills in suture not necessary Not enough teaching on wound dressing One lecturer expanded on emergency medicine too much (not relevant for GP)
Weaknesses of the intervention	Many practical exercises/skills Practice exercises—suturing Practical exercises—bandaging (compression bandage, Finger bandaging) Practical exercises—physical examination of joints Picture quiz Wound management procedures in GP Burns injuries, 'rule of palm'
	Without surgical experience (n=8)
	With surgical experience (n=9)
Content remembered	Reflection and exchange on which level of minor surgery can be offered in general practice Practical exercises—suturing Practice exercises—bandaging Practical exercises—splinting Picture quiz Wound dressing A challenge after 1 year
	Without surgical experience (n=8)
	With surgical experience (n=9)
Category	Without surgical experience (n=8)

Continued





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.<sup>27</sup>

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),<sup>18</sup> the sequence of learning could be the following: first, self-awareness of competency gaps in minor surgery, accompanied by skills and motivation to deal with them (compact intervention in minor surgery, preferable in the first year of training). Then second, 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: first, 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. Second, 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 overestimation of the observed effects, especially since competencies are not independent of each other. Still, the observed group means show relevant differences. Third, validated assessment of competencies (written and/or oral and/or practical such as directly observed procedures) could not be implemented. Fourth, 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<sup>plus</sup> 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.<sup>28</sup>

### 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.

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