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RUNNING HEAD: Newly qualified medical specialists' professional learning

Learning beyond graduation: Exploring newly qualified specialists' entrance into daily practice from a learning perspective

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Abstract

The entrance of newly qualified medical specialists into daily practice is considered to be a stressful period in which curriculum support is absent. Although engaging in both personal and professional learning and development activities is recognized fundamental for lifelong professional competence, research on medical professionals' entrance into practice is scarce. This research aims to contribute to the framework of medical professionals' informal learning and outlines the results of an exploratory study on the nature of learning in daily practice beyond postgraduate training. Eleven newly qualified physicians from different specialized backgrounds participated in a phenomenographic study, using a critical incident method and a grounded theory approach. Results demonstrated that learning in the workplace is, to a large extent, informal and associated with a variety of learning experiences. Analysis shows that experiences related to diagnostics and treatments are important sources for learning. Furthermore, incidents related to communication, changing roles, policy and organization offer learning opportunities, and therefore categorized as learning experiences. A broad range of learning activities are identified in dealing with these learning experiences. More specifically, actively engaging in actions and interactions, especially with colleagues of the same specialty, are the most mentioned. Observing others, consulting written sources, and recognizing uncertainties, are also referred to as learning activities. In the study, interaction, solely or combined with other learning activities, are deemed as very important by specialists in the initial entrance into practice. These insights can be used to develop workplace structures to support the entrance into practice following postgraduate training.

Keywords

Critical incident analysis- informal workplace learning- learning process- newly qualified medical specialists

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Introduction

The initial entrance for newly qualified medical specialists into daily practice is considered to be a stressful period: it comes with new expectations, new responsibilities, new ways of working and social integration (Lockyer, Wycliffe-Jones, Raman, Sandhu and Fidler, 2011; Westerman, 2012). Opposed to earlier transitions, newly qualified medical specialists enter the profession without the comfort of supervision and curriculum support. Notwithstanding the demands of the initial entrance into practice, newly qualified specialists are expected to perform and manage the tasks, the duties and the responsibilities that correspond to the new positions all while ensuring that standards are met and professional performance is guaranteed. To be lifelong professional learners capable of both reflecting on and assessing their daily practice, responding to changes and needs and exploiting occurring experiences and engaging in personal and professional development activities is required and learning is fundamental (Cruess and Cruess, 2005; Kilminster, Zukas, Quinton and Roberts, 2010, 2011; van de Wiel, Van den Bossche, Janssen and Jossberger, 2011). While accreditation systems oblige engagement in formal continuing medical education programs, learning after the completion of formal training is most often embedded in informal work-related activities and experiences in the day-to-day practice (Sargeant et al., 2006). Although research shows that informal learning is an important type of learning in medical practice (Deketelaere, Kelchtermans, Struyf and De Leyn, 2006; Dornan, 2012; Eraut, 2007; van de Wiel et al., 2011), insights in the nature of experiences as opportunities for learning beyond graduation and the potential dimensions of informal learning, are scarce. The current study aims to increase understanding on informal learning of newly qualified medical specialists by exploring work-related experiences and activities during job performance in the transition beyond graduation.

Learning in medical practice

Experiences in medical workplaces in general, and more specifically in medical practice have long been recognized as powerful learning opportunities (Cleland, Leaman and Billett, 2014; Dornan, 2012). However, learning cannot simply be seen as an accumulation of practice. Learning from experiences takes place when activities and interactions are accessed and actively engaged in by individuals (Cleland et al., 2014; Wagenaar, Scherpbier, Boshuizen and van der Vleuten, 2003, Teunissen, 2008). In medical practice, formal learning happens through structured activities and educational experiences that are purposely offered. However, the workplace informally offers a great number of unplanned activities and experiences which can be sources for learning. Notwithstanding the fact that it is not the distinction between formal and informal learning but merely actively taking up these chances that is a prerequisite in both formal and informal learning (Cleland et al., 2014), a great deal of what is described as learning in medical practice is informal in nature (De Ketelaere et al., 2006; Dornan, 2012; Eraut 2007; van de Wiel et al., 2011). Current models suggest that informal learning in the workplace distinguishes between three types of learning founded in different levels of intention (Eraut, 2004; Tynjälä, 2008). The phenomenon of *implicit informal learning* is described as learning in the absence of knowledge about what has been learned and with no intention at all to learn (Eraut, 2004; Tynjälä, 2008). *Reactive informal learning* takes place when a learning need emerges in the middle of action, during job performance. This learning refers to more conscious and intentional efforts to learn, but the purpose of the action is not to learn but to complete a work task. Reactive learning is also referred to as an “emergent strategy” (Eraut, 2000, p.116). *Deliberative informal*

learning has the highest level of intentionality. Learning goals are set and time is reserved to deliberately acquire new knowledge or insights. Although time is set aside, the main purpose of this latter type of learning is work-related, with learning as a probable side-product (Eraut, 2004; Tynjälä, 2008).

A vast amount of studies on physicians' learning, during the different phases of the medical curriculum (clerkship and residency), report a range of concepts and models of learning. However, the present medical education literature lacks a coherent picture of what constitutes informal learning during day to day work. This may be partially due to inconsistencies in the use of the concepts of learning "experiences", learning "activities", and learning "processes". Particularly, these concepts are often used interchangeably, entailing a different meaning or content although similarly named and furthermore, concepts with a similar meaning or content are named differently (Dornan, Boshuizen, King and Scherpbier, 2007; Duvivier, Stalmeijer, van Dalen, van der Vleuten and Scherpbier, 2014; Sargeant et al., 2006; van de Wiel et al., 2011; Van der Zwet, Zwietering, Teunissen, van der Vleuten and Scherpbier, 2011). The differential definitions across the literature underpin the richness of the field but fall short of providing a coherent conceptual framework in which studies engaged in research on learning in medical practice can be organized and integrated.

Further, in studies that focus on identifying the nature of physicians' learning, learning processes are often tied to experiences and activities (Dornan et al., 2007; Duvivier et al., 2014; Sargeant et al., 2006; van de Wiel et al., 2011; Wagenaar et al., 2003). From a process-oriented view, learning is seen as an active and constructive lifelong enduring operation, cyclical in nature, relating multiple individual and interactional activities to direct learning, in terms of cognition, behavior and motivation, and comprising the mental processes that individuals engage in (Bakkenes, Vermunt and Wubbels, 2010; Pintrich, 2000). An observation from the referred studies is that although physicians' learning is often characterized as a process, the actual processes, in terms of co-occurring activities, remain vague. Most often, solitary overt activities are described through which learning processes take place, omitting 'inner' mental activities, such as reflecting, thinking, and interpreting. Research in other fields provides examples describing learning in a more process-oriented way. These studies emphasize the dynamic and phased nature of learning processes, connecting phases and actions undertaken and representing sequences and recurring patterns of activities that individuals go through (Endedijk, Hoekman and Slegers, 2014; Meirink, Meijer and Verloop, 2007; Zwart, Wubbels, Bolhuis and Bergen, 2008). A range of learning activities, both thinking and acting activities, and relations between multiple learning activities could be distinguished in some studies (Meirink et al., 2007; Zwart et al., 2008). The results of these studies show that different sequences involving successive activities were found and patterns of succession could be detected, connecting thinking activities to acting (Meirink et al., 2007; Zwart et al., 2008). The results show that investigating the nature of, and interrelatedness between, both overt and covert learning activities can be important to further understand how newly qualified medical specialists learn.

In conclusion, describing learning experiences and activities is a necessary first step in gaining insight into the nature of newly qualified specialists' informal learning in the workplace. The theoretical frameworks referred to above, inspired the definition of learning experiences in this study as *workplace experiences related to critical incidents recalled by newly qualified medical specialists in which a shortage of competence or uncertainties are perceived or instant solutions for problems during job performance are absent, leading to participation in any kind of informal learning activities*. Accordingly, informal learning activities are understood as *all activities - overt and covert - informally undertaken to address shortcomings, uncertainties, or problems experienced while performing the job in the workplace*. Based upon the findings of the aforementioned research on the learning of

physicians in different phases of the medical curriculum and beyond, we expect to find a variety of learning experiences and informal learning activities. More specifically for learning experiences, we expect newly qualified medical specialists to describe complex and recurring practical and medical problems as learning experiences. As learning activities, we expect to find learning by observing and interacting, learning by doing, learning by reflecting and learning by reading available literature, the internet or handbooks (Dornan et al., 2007; Duvivier et al., 2014; van de Wiel et al., 2011; van der Zwet et al., 2011). Consequently, as a second step, investigating the relation between learning activities offers potentially in-depth understanding of occurring learning processes in medical practice. Based on the findings of the research, in the context of teacher learning, we expect to find co-occurrences between learning activities.

Despite the arguments for the importance of learning during the initial entrance into practice, and the existing research on learning within the context of the medical curriculum, research on newly qualified specialists' informal learning in the workplace, is limited. This research aims to contribute by questioning what are the work-related critical incidents that newly qualified specialists describe as potential learning experiences, what informal learning activities they participate in to act upon these experiences, and whether co-occurrences exist between learning activities.

Methods

Context and participants

The study was conducted in Flanders (the Dutch speaking part of Belgium) and consisted of eleven newly qualified medical specialists who had been practicing medicine independently since graduation. A conceptually driven sequential strategy was used to select physicians practicing different medical specialties (Miles and Huberman, 1994). This qualitative sampling provided the opportunity to add participants to the sample, driving a new round of data collection, to assure that rich conceptual variation could be derived inductively from the data during the process of the study (Corbin and Strauss, 2008; Curtis, Gesler, Smith and Washburn, 2000). All participants (four Female, seven Male) graduated within the last 15 months with an average of 7.45 months of working experience (SD: 3.37). All specialists signed informed consent forms in which a clear procedure was described allowing for the refusal to answer questions. No ethical approval was required from the Ethics Committee for the Social Sciences and Humanities (University of Antwerp Ethics Committee for the Social Sciences and Humanities, 2012) because the current research did not fall under the Belgian Law of Experiments on Humans (May 7, 2004). Participants were consenting adults and data were anonymous. Participation was voluntary, uncompensated, and confidentiality was guaranteed.

Interviews and procedure

A qualitative research method with a grounded theory approach was used to derive theoretical relationships based on an iterative process (Glaser and Strauss, 1967). This phenomenographic study used a critical incident technique to recall data and explore which work-based incidents had triggered newly qualified medical specialists' learning embedded in the performance of daily practice. The process of data collection and analysis was conducted concurrently, the process was recursive and interpretive, and performed consecutively until data saturation was achieved (Miles and Huberman, 1994). During the entire process of the study, peer-debriefing sessions were conducted in which the different methodological choices, data collection and data analysis procedures and interpretations were critically examined (Cresswell and Miller, 2000). Semi-structured interviews, guided by an interview protocol, were used to recall at least three work-related incidents. At recruitment, participants were

told that the interview concerned learning in the workplace. The key interview questions had asked them to describe a recent work-related situation in which they themselves were confronted with a problem of any kind for which they did not have instant solutions. Open-ended questions were asked to elicit rich descriptions of situations. Subsequent questions explored the different activities that the interviewees engaged in, focusing on underlying goals, monitoring, regulation, and reflection to uncover overt and covert activities. It also was questioned who was involved in their approach to the encountered problem. Participants were prompted by additional questions, such as why other people were involved, how they felt about the approach, why they dealt with the situation the way they did, whether they doubted their ability to deal with the situation, and how they looked back on the situation and their approach. The interview schedule was piloted and refined, and the same protocol was used in all eleven interviews to assure methodological consistency and control for reliability (Cohen, Manion and Morrison, 2007; Corbin and Strauss, 2008). Interviews were all administered face-to-face and digitally audio-recorded to yield accurate transcripts. The medium interview length was about one hour and all data was to be treated anonymously. With member checking, in which the raw data were commented on in terms of accuracy and depth of substance, validity was enhanced (Corbin and Strauss, 2008; Miles, Huberman and Saldaña, 2014).

Analysis

Phase 1: analysis of interviews. The inductive approach started by comprehensively reading the interviews transcribed verbatim from beginning to end, to obtain an overall impression (Cohen et al., 2007; Miles et al., 2014). In the subsequent coding and categorizing process, data was reviewed iteratively to enable theory to be generated from them. Transcripts were first open coded using the qualitative software package Nvivo 10, and codes and detailed subcodes progressed, while experience developed establishing a well-developed theory (Corbin and Strauss, 2008). Subsequently, axial coding was applied, grouping and regrouping features into categories, relating categories to subcategories, to conceptualize findings (Corbin and Strauss, 2008).

Phase 2: integration of learning activities. The next step in analysis comprised the integration of all learning activities across learning experiences in a matrix. Rows and columns both consisted of learning activities withheld, and the number of times an association occurred was tallied, resulting in numerical data to represent associations between learning activities reported in the interviews (Miles and Huberman, 1994).

Results

To answer the research questions, the results of the coding and analysis concerning learning experiences, learning activities and co-occurrences between learning activities are summarised here along with supporting quotations taken from the transcribed interviews.

Learning experiences

The data derived from the interviews indicate that different kinds of learning experiences and learning activities can be distinguished. In sum, 63 different work-related incidents were identified, 47 of which involved at least one activity to deal with the problem mentioned. We identified these 47 problems as experiences contributing to the learning in the workplace of newly qualified medical specialists. Findings are summarised below according to the four qualitative distinct categories found in the participants' rich descriptions: learning experiences related to diagnosis and treatment, policy and organisation, changing roles, and communication.

Diagnosis and treatment related learning experiences were most often mentioned (N=40) and a variety of situations were captured. Newly qualified medical specialists indicated problems that they had not dealt with on their own responsibility in the past, such as being confronted for the first time with diagnosing or treating complex, rare pathologies. They also referred to treating pathologies or diseases that crossed their specialty line as learning experiences. Not being able to diagnose, and situations in which treatment on their own was not possible, were also mentioned. Furthermore, uncertainty about medication, acute treatments beyond the acknowledged evidence-based medicine, treatments under discussion and conflicts with colleagues concerning treatment or diagnosis were referred to as learning experiences within this category.

“There was this patient I operated on, whose diagnosis was not made in advance. We didn’t know exactly what was wrong and what the problem was. This man fell out of his truck and since then fluid was leaking out of his ear. We knew this was cerebrospinal fluid, but we did not know where it came from.” (ear, nose and throat specialist)

Policy and organization related learning experiences (N=7) referred to describing problems such as: long waiting lists, dealing with rivalry between hospitals influencing job-performance, financial issues, changing clinical procedures or sudden changes made by the government that impact upon operations within the department, and team-building.

“Recently there was an abrupt announcement by the Flemish authority saying that in the near future all patients with a chronic neuromuscular disease will have to be investigated in an academic health reference center to confirm the diagnosis and adjust the treatment. This implies an increase of 300 consultations a year for us. This is a problem we have to anticipate.” (neurologist)

Learning experiences connected to *changing roles* (N=4) were mentioned in the sense that newly qualified medical specialists described the overnight shift from being a resident/trainee to being a supervisor, expected to guide residents’ learning, evaluate and assess their learning, and be responsible for the actions and deeds of residents, as a problem.

“From time to time residents give me an assessment document for the clinical work they have been doing, a standardized evaluation form, which I have to fill in. I don’t like to do this, evaluate residents, because I haven’t been trained to do it. I don’t know how to do this, I don’t know how I should honor their work and grade them accordingly in a fair way!” (neurologist)

Communication related learning experiences (N=2) were described as problems that concern communicating uncertainty to patients, and too honest or too much communication with patients.

“There was this young man, 21 years old with an atypical complaint. I performed an echography and diagnosed a heart valve problem. This was a rather coincidental finding not related to his complaint. I informed him of the fact that this valve problem was not such a great problem but that he might need a new valve within 20 to 25 years. He was very active in playing sports, so I advised him to wait to do sports until we did some extra tests. I must have given him too much information, and he probably went home with more questions than answers, because 15 minutes later I got a phone call from him asking if he could come back for more information.” (cardiologist)

Learning activities

In dealing with the prior 47 learning experiences, newly qualified medical specialists described a total of 160 learning activities undertaken when triggered - implicitly or explicitly - by such a learning

experience. Six different categories could be distinguished: interacting with others, doing, consulting written sources, recognizing uncertainty and communicating this honestly, observing others.

Interacting with others came to the fore most often among all newly qualified specialists (N=74) when confronted with a problem or insecurity. This interaction involved consulting, seeking help and feedback, discussing, thinking aloud or reflecting together. This interaction was mentioned most often with a physician of the same specialty (N=36), who could also be an expert or authority in the domain (N=8). Multi- and interdisciplinary interaction among physicians of other specialties (N=9), or other disciplines (N=10), also accounted for a part of the variance in learning activities. Other disciplines, such as nurses, psychologists and social workers, were mentioned. Interaction with the patient or family (N=11) was often mentioned to imply guidance or information, in addition to the anamnesis referred to be sought.

“At a certain time, I asked myself if I had diagnosed the patient correctly. At that time I started discussing it with my direct colleagues, who then give me their opinion.” (gastroenterologist)

The interviews supported *doing* something as a learning activity (N=48), with great variance in the activities to be undertaken being mentioned by newly qualified specialists. Learning by trialling and testing was the doing-activity most often chosen to deal with problems (N=14). Nonetheless, interviews showed that the trialling and testing referred to by newly qualified specialists was mostly performed after written sources or a colleague were consulted. In doing extra research, clinical (N=3) or technical (N=8) investigations, other than standard procedures, were meant. Diagnosing, treating and/or doing surgery in a specialized team (N=10) was an often-mentioned activity when problems occur. When no colleague was available, participants referred to preparing for all possible solutions, to avoid overlooking something (N=6). Breathing and relying on the competences gained during specialty training (N=5) were activities mentioned to promote calm in extremely difficult, and often urgent, situations. Although the new role of supervisor was mentioned as a problem, some newly qualified specialists valued this role and saw the potential in learning from it (N=2), mainly for keeping up to date with evolving practices.

“I took a deep breath and tried to think of all the reasons why people can wake up more slowly [*i.e., breathing and rely on competences*], I checked the amount of anesthetics still in the body, breathing out [*i.e., extra technical research*], but they were almost gone. Then I thought about the dose of opiates I gave? Maybe that was a little bit too much? Then I checked the pupils: they were not pin points, not very small, which would have been the case with too much opiates... that was not the case [*i.e., extra clinical research*]. I also checked the dose of muscle relaxants with a special device [*i.e., extra technical research*] maybe they were no longer working? This appeared to be ok. At the same time I did some clinical tests and checked all the parameters [*i.e., extra clinical research*].” (anesthesiologist)

Most of the newly qualified specialists mentioned at least once making use of *consulting written sources* to deal with a problem (N=20). Handbooks, guidelines, review articles and the internet were the most frequently mentioned sources, besides consulting the patient file. Some of the newly qualified specialists described a deliberate approach to this activity, setting up journal alerts to be notified when articles in their field were published and reserving weekly spare time to keep track of relevant evolutions. Furthermore, what they experienced during job-performance was reported as an incentive to keep reading.

“I search for new guidelines concerning medication, or articles. I adjust my procedures to the literature I read.” (psychiatrist)

Communication of uncertainties was mentioned as a learning experience. Nevertheless, newly qualified specialists described *recognizing this uncertainty and communicating this honestly* to their patients (N=10) as an activity they took on when they really don't know.

"I honestly didn't know, so I acknowledged this to the patient, telling her that we would have to see what would happen and that I couldn't guarantee that it would work, but that it was the only thing we could try at that moment." (gynecologist)

Observing others was referred to when faced with a problem situation (N=8). They named "see one, do one" as a helpful approach to learn new procedures. Participants referred to observing experts and other physicians of the same specialty with more experience in the situations mentioned.

"I went to a reference center to observe how specialists there perform this procedure." (urologist)

Co-occurrences of learning activities

The association matrix, crossing the occurrence of all different learning activities, revealed many related learning activities, which can be referred to as co-occurrences. Co-occurrences were found both on a main category-level and subcategory-level of learning activities. The associations detected on a main category-level are depicted in Figure 1, where those associations that occurred most often are denoted in bold. Also, thicker arrows denote greater frequency. The associations not occurring are not mentioned.

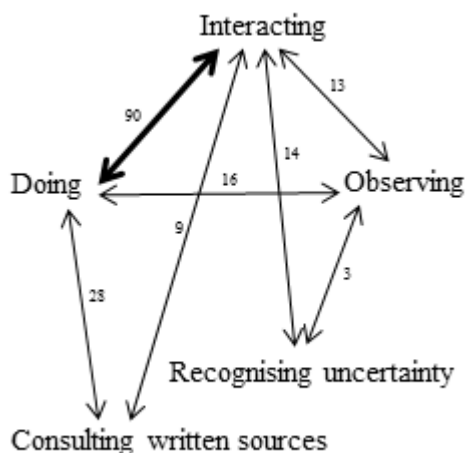


Figure 1. Activity co-occurrences on a main category-level

Inspection of Figure 1 shows that on a main category-level 90 co-occurrences were present between interacting and doing. Newly qualified specialists most frequently described combining interaction with another physician or colleague of another discipline, with doing something to participate in an encountered learning experience. Besides co-occurring with doing, interacting co-occurred, although far less frequently, with all other learning activities depending on the learning experience engaged in. Learning by doing co-occurred 28 times with consulting written sources, meaning that, when confronted with a difficult situation or a situation for which they didn't have an instant solution, newly qualified physicians described learning by doing something before, or after, they have consulted the internet, an article or another written source. Doing also co-occurred with observing, which underlined the earlier principle of "see one, do one". Recognizing uncertainty only seldom co-occurred with

observing. Finally no co-occurrences were found between consulting written sources, and recognizing uncertainty, consulting written sources and observing. The latter could mean that newly qualified specialists choose one or the other to combine with other learning activities.

On a subcategory-level, the associations detected give a more nuanced view on co-occurring learning activities, which are depicted in Figure 2. On a subcategory-level very small numbers were found. Again, those associations that occurred most often are denoted in bold and thicker arrows denote greater frequency. The associations not occurring are not mentioned.

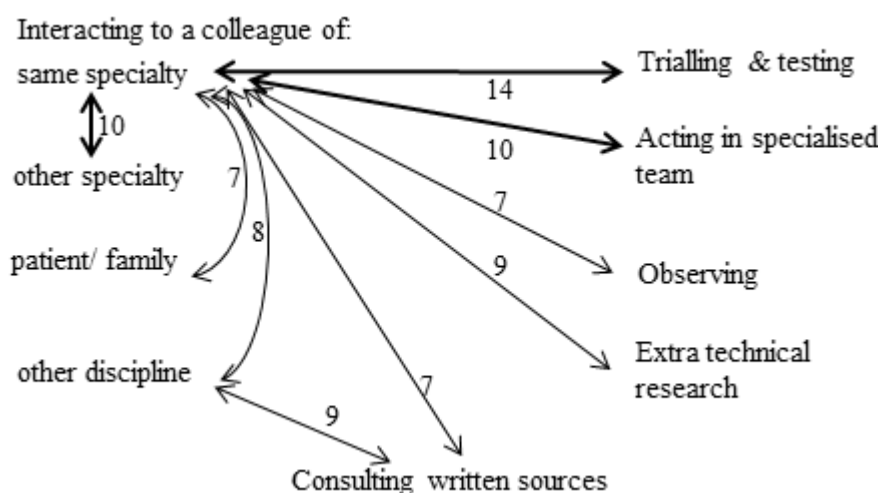


Figure 2. Activity co-occurrences on a subcategory-level

Out of a total of 188 co-occurrences tallied, the most notable of all on a subcategory-level were with interacting with a physician of the same specialty. Interacting with a colleague of the same specialty was referred to in combination with most of the other learning activities, addressing the importance of colleagues of the same specialty in different associations. Notable is the co-occurrence between both this learning activity and trialling and testing (N= 14). This means that when in a situation perceived as a problem, newly qualified specialists indicated interacting with a physician of the same specialty, and applying trialling and testing to deal with this situation. Although very low in number, another noteworthy finding is the co-occurrence between trialling and most other learning activities, meaning that trialling and testing were not mentioned as conducted, as such, but almost always after learning was sought in other learning activities. The quotation below, illustrates how different learning activities undertaken by an ear, nose, and throat specialist, co-occurred when engaging in a learning experience.

“This man came to my consultation and I didn’t know where the fluid came from. We did a CT-scan [*i.e., extra technical research*], which didn’t show where the fluid came from. Then I read all the articles on the topic of cerebrospinal leakage in scientific journals [*i.e., consulting written sources*] and I discussed the problem with the head of my department [*i.e., interacting with a colleague of the same specialty*]. At the staff meeting we discussed this problem with the radiologists and the neurosurgeons [*i.e., interacting with colleagues of another specialty*]. We all looked at the images and still didn’t know where the fluid came from. So I communicated this uncertainty openly with my patient [*i.e., recognizing uncertainty*] and said that the only option was to operate and see what it was and also how we could help him. The surgery was performed together with the head of department and the neurosurgeons [*i.e., doing in a specialized team*] and then finally we found where this fluid came from. Afterwards we looked again at the images in a staff meeting to check if we could have seen this after all [*i.e.,*

interacting with colleagues of another specialty].” (series of co-occurrences - ear, nose, and throat specialist)

Discussion

Although transitions in the medical trajectory are described as stressful periods, research on the nature of learning in the transition from postgraduate training to the initial entrance into practice is largely lacking. Further, prior research in the field of workplace learning, in and beyond medical education, deals with conceptual clarity issues. Learning experiences and learning activities have been used interchangeably and the concept of the learning process has been operationalized and measured merely as isolated occurring overt activities, without relations to other, overt and covert, ongoing activities. This study addresses this gap and contributes to the theory of informal workplace learning by investigating newly qualified medical specialists’ learning in the workplace. A qualitative approach with an emphasis on context-rich descriptions was applied and in-depth interviews were used to explore the nature of newly qualified medical specialists’ informal learning in the workplace. The chosen methodology, proved to be most appropriate for an in-depth exploration of the phenomenon of learning in the workplace and applying the same procedure and interview-protocol ensured comparability of the data. By means of capturing critical incidents as experiences in which learning took place in the narratives of medical specialists, we are able to offer a clear differentiation in the concepts of learning experiences and informal learning activities. Additionally, it presents detailed descriptions of such learning experiences and activities, as reported by newly qualified medical specialists.

The analysis of the reported critical incidents indicate that experiences contributing to the learning of newly qualified medical specialists are greatly founded upon core work activities and everyday experiences, in relation to treating and diagnosing patients. Further, it became clear that other occurring learning experiences, in relation to changing roles, communication and policy and organization were repeatedly mentioned. Our findings connect to earlier research, which points to learning by participating in daily clinical practice, from actively engaging in new kinds of challenging tasks and tasks related to problem-solving and overcoming gaps in practical and professional competences (Cleland et al., 2014; Dornan et al., 2007; Wagenaar et al., 2003).

Analysing the data about the nature of informal learning activities that newly qualified medical specialists participated in revealed a rich variety of learning activities that could be distinguished as sources of informal learning in our study. The interviews established that interactions with different actors was found to be a distinct learning activity during the first months of daily clinical practice. The role of physicians of the same specialty, whether or not an expert, was apparent in our data. Our findings also support learning by doing as an important learning activity, which is in line with findings in earlier research that reports on different activities, such as seeing patients, teaching and explaining, holding independent consultations, and talking (Duvivier et al., 2014; van de Wiel et al., 2011; van der Zwet et al., 2011). Although newly qualified specialists’ referred to interacting and collaborating with others as principal learning activities, they also reported learning from literature, which is in line with the learning activities that experienced physicians engage in (van de Wiel et al., 2011). Besides overt learning activities, our findings give insight into a limited range of covert learning activities. Reflection, which much research on learning in practice refers to as an important mediator for learning, was an evident finding and noted in our study. Thinking aloud, as an externalization of knowledge and cognitive processes, could be detected. Newly qualified medical specialists employed a scala of learning activities when confronted with challenging experiences as described, with interacting with others being central to their approach.

From a process-oriented view on learning, research in the field of teacher learning initiated our study concerning co-occurrences between learning activities. Research on learning processes in the

field of medical education mostly presents them as solitary overt activities, thereby excluding inner mental activities and relations between different kinds of activities. In doing so, an overly simplified picture of what constitutes informal learning in the workplace is provided, rather than the quite complex picture that is expected based on the existing literature in other fields (Endedijk et al., 2014; Meirink et al., 2007; Zwart et al., 2008). Describing the co-occurrences between multiple learning activities, at both the levels of general categories of learning activities and the more detailed subcategories, was a necessary first step to gaining insights into the actual learning processes of newly qualified medical specialists, and expanding the existing body of research on physicians' learning in daily practice. The ascertained high rated co-occurrences between interacting with a physician of the same specialty and other learning activities, highlights again the importance of interaction in the learning of newly qualified medical specialists. Principal findings on a subcategory-level showed the important role of physicians of the same specialty in this relations. Newly qualified medical specialists sought colleagues, extracting the missing knowledge from their network, to individually or collaboratively build competences and solve problems during work-performance. Surely, interactions within a newly qualified specialists' network are fundamental for newly qualified medical specialists to answer the challenges of initial entrance into daily practice. Although mediated by computers, central ideas of research on 'networked expertise' (Hakkarainen, Palonen, Paavola and Lehtinen, 2004) and 'networked learning' (Goodyear, 2005) relate to the insights of our research. However, another noteworthy finding was the use of trialling and testing, as a learning activity, in co-occurrence with other learning activities. Notwithstanding their responsibility, or maybe rather because of it, newly qualified medical specialists allow themselves to learn by experimenting 'safely' on different occasions, by almost always using trialling and testing in relation to other learning activities. As it seems, newly qualified medical specialists do not merely experiment. They avoided risking failure by forming hypotheses regarding possible solutions or problem-solving strategies, based on the knowledge or insights obtained through, among others, consulting colleagues, the internet, articles and observation. When needed or recommendable, and within the bounds of possibility, newly qualified medical specialists allow these hypotheses to evolve over time, thereby recognizing the importance of honest communication with the patient, to maximize chances for success.

Despite the above combined results and strengths, some limitations have to be acknowledged. In analyzing the data from a grounded theory approach we allowed the data 'to speak for itself' (Strauss, 1987). This is a strong approach to generate theory and higher ecological validity is afforded. Notwithstanding the fact that the process of debriefing was applied throughout data analysis, conceptual interpretation was created, fitting plausibly with the reality. Since we relied on gathered reports from the specialists themselves to describe the nature of informal learning, and results were not gauged against other, we did not assume uncovering the objectified truth but provide a rich description of newly qualified specialists' self-reported informal learning. Regarding the mapping of learning activities, triangulation of methods, using for example observations or other techniques, could enhance the external validity of the findings. However, this addressed limitation may not entirely account for the findings concerning the inner learning activities. Different qualitative methods to assess processes of learning, thereby recalling thoughts and feelings as they occur, rely on self-reporting techniques (Boekaerts and Corno, 2005). Notwithstanding the limitations of these self-reporting techniques for the measurement of overt activities (Veenman, 2011), they could be among the very few that enable verbalizations of inner activities. Concerning the inner learning activities, in this study we were not able to uncover a range of learning activities. Although the respondents were prompted to give a detailed description during the semi-structured interviews, the narrative style of the participants greatly influenced the findings. We aimed to explore the nature of learning in a small sample and transferability was not intended. The presence of theoretical saturation, in combination with a variety of reactions from the respondents, suggests assured representativeness. Theoretically, we are aware of

the fact that when asking newly qualified medical specialists about tasks they experienced as challenging, what they reported was often based upon personal epistemological processes and beliefs. We should take into account that the described experiences would vary with their individual experiences and contexts, values, conceptions of learning in the workplace and interpretations of the situations. However, personal epistemology added value and richness to the interviews and strengthens this research. Our results could inspire research in other contexts of medical practice and other professional domains, showing the informal nature of much learning in the workplace.

The results of this study showed that, when asked about learning in the workplace, newly qualified medical specialists mainly reflected on experiences and activities related to the professional competences for their role as physician. Experiences and activities in relation to more general competences were less thought of. This does not necessarily mean that newly qualified medical specialists value or learn these general competences to a lesser degree. When they were asked about challenging tasks that they experienced, problems related to clinical practice noticeably popped-up first. This could mean that the focus of newly qualified specialists focus in their first months of initial practice was mainly on 'being' a good physician and attention is mainly- possibly only apparent- on diagnosis and treatment related situations. Future research could shed more light on the importance of experiences and activities related to more general competences for learning during the initial entrance into practice. As mentioned in the previous paragraph, referring to certain experiences is influenced by earlier experiences, contexts, values, conceptions and interpretations. Research on conceptions of learning in the workplace, and the influencing personal and contextual factors of newly qualified medical specialists' learning, could offer valuable insights in their approach to learning. Further, semi-structured interviews as a data collection technique was inspired by existing theoretical frameworks. Although open-ended questions were used for data collection, semi-structured interviews leave less flexibility to adjust to differences in the narrative style of the respondents. Potentially relevant but salient information could be omitted (Cohen et al., 2007). Using open interviews, could allow for matching questions to the respondents and the circumstances, yielding even richer data. However, comparability of responses and data analysis could be quite difficult. Furthermore, the accuracy of recalled information on experiences and activities using semi-structured interviews, was influenced by the respondents' capability to reconstruct memory. Using methods measuring learning during work-related learning tasks capturing overt actions, such as observations or video-registration of behavior and communication, or methods measuring learning directly after work-related learning tasks, such as stimulated recall interviews or diaries/logs, could shorten the delay between actual behavior and questioning, thereby minimising distortions due to memory failure (Veenman, 2011). Taking into consideration the aforementioned implications of the use of semi-structured interviews as data collection technique, and the fact that research on physicians' learning is conducted most often from a qualitative perspective using interviews, multi-method and/or mixed-method designs, triangulating self-reporting and other techniques could build a more comprehensive picture, as we already illustrated the unraveling of inner learning activities and their relation to other learning activities. Besides, since learning in interaction was revealed to be an important learning activity for newly qualified medical specialists, it seems to us that learning in and from interactions is of major importance in future research. The perspective of interpersonal regulation (Vauras and Volet, 2013) could offer an interesting framework to disentangle the informal nature of physicians' learning in the workplace in general, and more particularly of specialists' learning in the workplace.

This study explored the experiences that newly qualified medical specialists described as critical for their learning in the first months in practice and the activities that they actively engaged in, which was previously a neglected area in the field of medical educational research. Former models of informal learning suggest, newly qualified medical specialists' learning often is integrated with their daily

work. Further, our findings suggested that for newly qualified medical specialists to be, and strive to be, good doctors, a specific range of learning activities is applied and engaged in to overcome difficulties in which trialling and undertaking different kinds of actions are paramount. However, interactions with other people, especially colleagues of the same specialty, either solely or in relation to other learning activities, are central in this learning.

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