

Summary

This thesis is concerned with doctors who are learning to become medical specialists. Following graduation, many doctors will embark on some sort of postgraduate training programme leading to certification to practise as a medical specialist in a particular field. In most countries, doctors in a specialist training program are called residents. Residency programmes mainly consist of on the job, or workplace learning, where residents progressively take on more responsibility for patient care, with decreasing supervision by attending physicians. This thesis reports on research projects that were conducted in the Netherlands between 2005 and 2008.

Chapter 1 explains that in the last ten to fifteen years major reforms were initiated to transform medical specialist training. Reform was deemed necessary because of public dissatisfaction with present-day healthcare services, concerns about preventable medical errors, high reported rates of burnout and depression among junior doctors, a lack of transparency in the outcomes of specialist training, and an exponentially growing body of biomedical knowledge. After discussing differences in the structure and terminology of postgraduate medical education in the United Kingdom, the United States of America, and the Netherlands, chapter 1 describes the global shift towards competency-based postgraduate curricula and the introduction of new in-training assessment instruments. This is followed by a review of the literature on residents' learning in postgraduate medical education. It concludes that the current literature does not offer the much needed insights into what 'learning by doing' actually means in a postgraduate medical education context. Therefore, this thesis addressed the central research question: how do residents learn in the medical workplace?

Chapter 2 reports on a qualitative study that asked residents about their perspectives on how residents learn. In seven focus groups with residents of varying clinical experience, their experiences with and their ideas on learning in the medical workplace were explored. The research methodology involved a 'grounded theory' approach to identify recurrent themes and patterns in residents' accounts. The analysis resulted in an initial framework of residents' learning in postgraduate medical education. It reflected that participation in work-related activities is pivotal in residents' learning. The processes of *interpretation* and *construction of meaning* were proposed to explain how participation leads to a resident's evolving ability to think, perform, and interact. The results showed that what residents take out of a situation also depends on their interaction with other actors (for instance attending physicians) and physical features (for instance patient management software).

Chapter 3 continues the qualitative exploration of how residents learn by adding attending physicians' perspectives. The aim of the research in chapter 3 was to confirm, challenge and expand the insights offered by chapter 2. Attending physicians in one of three focus groups discussed their perceptions of how residents learn and what factors influence residents' learning. Again, a 'grounded theory' approach was used to analyse the transcribed discussions. Three related themes emerged. The first theme concerned the central role of participation in work-related activities: attending physicians confirmed that residents learn by tackling the everyday challenges of clinical work. The second theme

involved the ways in which attending physicians influence what residents learn from work-related activities. The third theme focused on attendings' views on characteristics that are essential for residents' development. These results complemented and expanded the insights from chapter 2. One of the expansions was the importance attending physicians attached to getting a sense of confidence in a resident's abilities. When attendings are confident about a resident's ability, that affects the responsibilities and participatory practices afforded to that resident. The main concepts involved in residents' workplace learning identified in chapters 2 and 3 provided the input to devise new research questions.

Chapter 4 describes an experimental study that investigated how context can influence a resident's learning. This research elaborated on a theme that recurred in chapters 2 and 3; the importance of interactions with other persons and contextual features in residents' learning. The theoretical foundation for this study came from the social psychology literature on category accessibility. This literature investigates how aspects of tasks can activate mental categories or concepts, and how activated mental concepts can subsequently influence people's judgements and decisions. Examples of mental concepts are traits and stereotypes. Activating mental concepts, without the subject's awareness, is called 'priming'. Using two experiments, chapter 4 explored the effect of 'priming' medically irrelevant mental concepts in one task on residents' interpretations in two work-related clinical situations. In the first experiment there were two 'priming' conditions, *ineffective* versus *effective coping*. In a subsequent, ostensibly unrelated task, residents had to indicate their affect in relation to a scenario of a challenging new situation. Priming with *ineffective coping* led to more apprehensiveness relative to priming with *effective coping* in the ratings of year three and year four residents. By contrast, among year one and year two residents an opposite tendency was observed. The second experiment investigated the effects of 'priming' *action* or *holding off* on residents' management decisions for a patient with excessive bleeding during her menstrual periods. Year one and year two residents primed with *action* opted significantly more often for a watchful waiting strategy than participants primed with *holding off* (a contrastive effect). Decisions of year three and year four residents showed a similar but less marked contrast. Both experiments showed no effects of 'priming' on residents in the final two years of specialist training. Explanations for these findings could be found in the literature on category accessibility and related to the specific examples and priming techniques that were used. In conclusion, chapter 4 showed that context can influence a resident's construction of a work-related situation by activating mental concepts which in turn affect how residents experience situations. Residents are not aware of this effect. Level of experience appears to play a mediating role in this process.

Chapter 5 investigates another aspect of the initial framework that resulted from chapters 2 and 3. As the attending physicians in chapter 3 clearly stated, to ensure patient safety residents need to be proactive in seeking feedback about patient management decisions. Chapter five turned to the organisational and social psychology literature on feedback-seeking to investigate what situational and personal factors influence residents' feedback seeking behaviour in relation to night-shifts. A

hypothetical model was constructed that involved four predictor variables (residents' learning and performance goal orientation, and their supervisors' instrumental and supportive leadership), two mediator variables (perceived feedback 'value' and 'costs'), and two outcome variables. The outcome variables were a resident's frequency of feedback inquiry (i.e. actively asking for feedback) and feedback monitoring (i.e. observing the situation and behaviour of others for self-relevant information). Of the 217 questionnaires sent to residents in 40 participating hospitals, 166 correctly filled in questionnaires were returned, giving a response rate of 76.5%. A statistical method called 'structural equation modelling' was used to analyse the hypothesised relations between variables. The results showed that residents with the goal to learn from their experiences perceive more feedback value and fewer costs. Residents who want to "look smart and avoid looking dumb" perceive more feedback costs. Attending physicians' supervisory style also influences the value and costs of feedback as perceived by residents. Supportive physicians lead to more feedback value and less cost. Residents who perceive more feedback value report a higher frequency of feedback inquiry and monitoring. More perceived feedback costs results mainly in more feedback monitoring. In short, these findings indicated how different variables, concerning residents and their supervisors, influence residents' perception of the value and costs of feedback and consequently their self-reported behaviour. These insights informed the further development of a comprehensive framework of workplace learning in medical education.

Chapter 6 turns to the literature on medical education and empirical studies of both facilitating practice change and the effectiveness of feedback, for best-practice guidelines on how residents can keep learning from their clinical experience. Based on those sources, chapter 6 describes the continuous personal endeavour lifelong learning requires from physicians. Physicians, including residents, have to be able to recognize situations that offer learning opportunities and then use these situations to set achievable learning objectives. Research on continuous professional development programs has shown that for learning to be most effective, residents have to be active directors of their own development. With their learning objectives in mind, residents can look for concrete task-related feedback from co-workers and patients, and where possible exploit available technologies (such as personal digital assistants) to learn from evidence-based-practice sources at the bedside. Portfolios may provide a way of monitoring one's learning trajectories and in doing so they help to avoid ineffective learning strategies. This approach to learning from everyday practice is only possible in an environment that values and supports these efforts. In essence, developing lifelong learning behaviour requires that residents develop the confidence to doubt their own practice.

Chapter 7 assembles the findings of previous chapters and unified the evolving insights in a comprehensive 'framework of workplace learning in medical education'. The first part of this chapter reviewed the main findings of the qualitative research in chapters 2 and 3 and related it to comparable research on workplace learning in undergraduate medical education. The second part of chapter 7 outlines the framework of workplace learning in medical education. The framework starts to clarify how residents learn in the medical workplace. Moreover, it can help researchers identify new research

areas while building on existing insights of learning in the workplace. This is important because a comprehensive conceptual framework was missing in the current medical education literature. Chapter 7 asserts that learning is an inherent aspect of functioning in the medical workplace. A conceptual analysis that can help to understand the development of individual residents starts by looking at (the sequence of) residents' tasks. Tasks bring together residents, other actors, their social systems and the material ecosystems (features and characteristics of the physical context) that enable, support, and constrain residents' participation and make tasks socially meaningful. Practices are an aggregation of tasks that provide a way to comprehend the influence of culture. The hierarchical layering of activities from tasks to practices, the indissoluble coupling between social systems and material ecosystems and their relations in time, result in complex eco-social systems. Residents' development can only be fully understood in relation to their involvement in eco-social systems. The ongoing participation in eco-social systems involves a conscious and unconscious interplay between personal attributes and personal experiences leading to thoughts that guide actions and that can change or consolidate a resident's ability to perform, think, and interact. The third part of this chapter discusses how the framework accommodates cultural-historical activity theory, the legitimate peripheral participation metaphor, social cognitive theory, and social psychological research on automaticity and category accessibility. The contribution of each of these domains is illustrated by presenting new research directions for the field of workplace learning.

Chapter 8 explains how all previous chapters contributed to the development of chapter seven's framework of workplace learning. It subsequently discusses that the strengths of this thesis are its relevance, methodological rigour, and the diversity of theoretical perspectives that were applied to further the understanding of residents' workplace learning. It also discusses that there are limitations such as the generalizability of the empirical results, sources of potential bias, and the innovative nature of the quantitative research, that have to be taken in account when assessing this thesis. The chapter describes implications for residents, attending physicians, and programme directors involved in medical specialist training and it ends with implications for medical education researchers. Chapter 7 argues that postgraduate medical training should move beyond the service-versus-education dichotomy. One way to do this is for curriculum developers to deliberately sequence clinical tasks as well as explicitly state expectations within tasks for junior doctors with different levels of experience. Next to the value of making learning opportunities and outcomes explicit, it also calls for an appreciation of the implicit learning effects of work-related tasks. For medical education researchers, the framework of workplace learning can be a valuable tool in recognising how research domains relate to each other and in deciding what insights are worth pursuing.