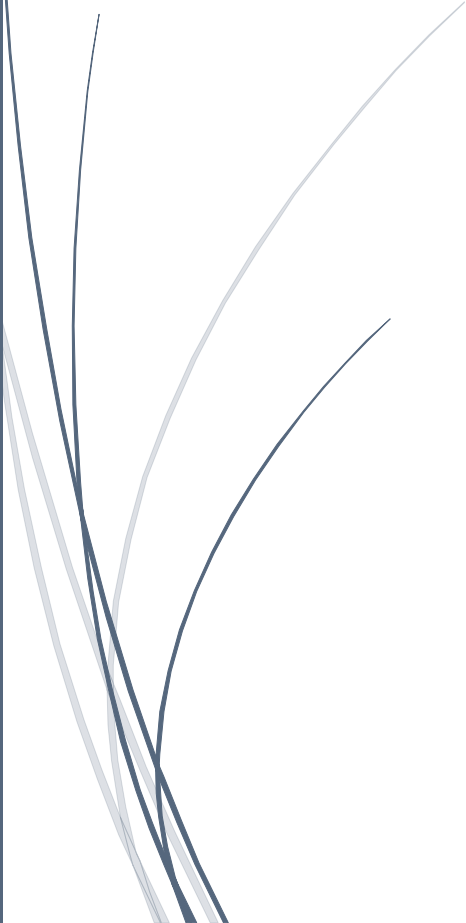


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9-9-2017

# Motivational factors in Electronic Medical Record training

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Master thesis

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## Chapter 1 Introduction

The use of health information technology (HIT) has become an important aspect in the delivery of health care. One of the major implications of HIT adaption is the implementation of electronic medical record systems (EMRs). These systems were introduced as the replacement of paper-based medical records by digital versions but evolved over time to complex systems with a largely increased functionality. Today's EMRs are HIT systems managed by health care providers and used to collect, store and display patient information, thereby allowing immediate availability of health information (Najaftorkaman, Ghapanchi, Talaei-Khoei, & Ray, 2015). Furthermore, these systems enable computerized physician order entry and decision support (Fasola et al., 2014).

EMRs have been widely recognized to have the potential to improve the quality and safety of health care. Perceived advantages of EMRs include optimization of documentation in the records, easier access to patient medical information, reduction of medical errors, enhanced database for research and quality improvements and reduction of paper (Yamamoto & Khan, 2006), increased adherence to guidelines, enhanced monitoring (Chaudhry et al., 2006), improved security of patient medical information and decision-making support and reduced duplication of efforts and documents (Ventura et al., 2011).

However, despite the promising opportunities EMR provides for the quality and safety of care, the overall adoption of EMRs is relatively low (DesRoches et al., 2008). Moreover, adoption alone is not enough for achieving the benefits of EMR use because it does not automatically result in healthcare improvements. Instead, in some settings the introduction of EMR has been associated with increased mortality (Han et al., 2005; Sittig, Ash, Zhang, Osheroff, & Shabot, 2006) and an increase in medication errors (Koppel et al., 2005). The participation of health care workers is an important factor affecting the success of implementation (Agnò & Guo, 2013). In particular, the inability of health care workers to use available EMRs in ways that would improve quality and safety of care has been considered a major factor averting the realization of the full potential of EMRs (Goveia et al., 2013). This is line with the argumentation of Holden (2011, p. 193), who states that *'the benefits of EMR do not come through the mere presence of these systems, but rather through their appropriate use'*. Holden argues that to benefit from the possibilities of EMR health care workers have to use built-in features and enter documentation and orders in complete and clear manner. Overall, the willingness and ability of health care providers to use EMRs effectively is of major importance for achieving the potential advantages of EMRs (Bredfeldt, Awad, Joseph, & Snyder, 2013).

Many researchers have recognized the need for training of health care professionals to enhance appropriate use of the EMR. To use training as an effective tool, it is important to assess what makes

a training program effective. According to Kirkpatrick (2005) training effectiveness could be assessed at four levels: reaction, learning, behavior and results. He argues that the transition from learning to behavior is most difficult. First, new knowledge, skills or changes in attitudes need to be learned before they can result in behavioral changes. This transition from learning into behavior is called the transfer of training: the application of what is learned on the training applied on the job. Baldwin and Ford (1988) developed a model of the transfer process in which the training input consists of trainee characteristics, training design and work environment. Which has been further developed by Holton, Bates, and Ruona (2000) into a theoretical model containing 16 learning transfer system inventory factors that are divided in four categories: motivation, trainee characteristics and work environment. Furthermore, previous research found that motivation to transfer had a mediating effect between the learning transfer system inventory factors and transfer of training (Grohmann, Beller, & Kauffeld, 2014; Massenberg, Schulte, & Kauffeld, 2016; Van den Bossche, Segers, & Jansen, 2010). Thus, knowing what factors influence motivation to transfer for a specific training program facilitates organizations with the possibility to improve transfer of training. In addition, the transfer of training literature provides a good framework to look at EMR training effectiveness from a different perspective. Currently, the literature regarding EMR training mainly includes research regarding the best training design. Based on research regarding the transfer of training one could argue that only implementing the best training design would be not enough for effective transfer of training. Instead, the trainee characteristics and the work environment highly affect the training outcomes and should therefore be taken into account.

## 1.1 Project Context

In this study we evaluate motivation to transfer with respect to an EMR training program, PLEZIER, which has been developed and provided by end-users: a group of ear, nose and throat (ENT) specialists who became experts in the use of EMR. These physicians from the Radboudumc aimed to transfer their knowledge to their colleagues by providing a tips and tricks training how to use the EMR effectively in the ambulatory setting. This training program will be evaluated by assessing the effect of transfer system factors on motivation to transfer. The aim of this study is to contribute to the theory regarding effective EMR training by linking transfer system factors to EMR training effectiveness at the Radboudumc. This result in the following research question for this study:

*‘What is the effect of transfer system factors on the motivation to transfer in the setting of the EMR training program PLEZIER at the Radboudumc?’*

The main contribution of this study is the linkage of two different research fields: EMR training effectiveness and transfer of training. On the one hand, this study thereby provides a broader

perspective on EMR training efforts by looking beyond the training design, also taking into account individual and organizational factors. The inclusion of transfer system factors enables indicating possible barriers and facilitators in achieving the desired EMR training outcomes. Thereby this study makes important strides towards enabling health care organizations to provide better EMRs training in their organization. On the other hand, this study contributes to the understanding of transfer of process in the context of health care organizations by linking transfer system factors to the motivation to transfer in order to enhance the use of EMRs. Thereby this study contributes to in-depth knowledge regarding transfer of training in different organizational types and different types of trainings. Which could in turn result in more precise knowledge regarding the influence of different transfer system factors in different settings. Finally, this study contributes to the practice of the Radboudumc by providing insight in the transfer system factors that are highlighted within their organization. Thereby it enables the Radboudumc to use their resources in such a way that it actually contributes to improved training outcomes.

This thesis is structured as follows: the next chapter a theoretical framework for this thesis is outlined, describing the concepts of EMR, learning, transfer of training, training evaluation. Chapter 3 contains the study methodology in which the study setting and design, the study population, the measures and the analysis are explained. This will be followed by an overview of the results. The last chapter includes the discussion and conclusion of this study.

## Chapter 2 Theoretical framework

In this chapter, first different theories of learning are addressed, followed by a description of transfer of training. Next, the aspect of training evaluation and motivation to transfer are will be discussed. Finally, the hypotheses are formulated and the hypothesized model is presented.

### 2.1 Electronic medical records

Many different Health information technology (HIT) systems exist and there is a wide range of names for these systems. These most commonly used terms are Electronic Health Records (EHRs) and Electronic Medical Records (EMRs). Although in the literature EHRs and EMRs are often used interchangeable (e.g. Najaftorkaman et al., 2015), the International Organization for Standardization (ISO) made a classification of different types of HIT systems (ISO/TR, 2005). In this overview, EHR is defined as 'a repository of information regarding the health status of a subject of care, in computer processable form'. In other words, this is a digital collection of all information about a person's health/ all records about health-related events. Instead, an EMR is more specific, focusing mainly on medical care within a health care organization (Nguyen, Bellucci, & Nguyen, 2014). EMRs could be departmental, containing clinical data entered by a particular hospital department, or hospital-wide, containing all patient's medical information from one hospital (Häyrinen, Saranto, & Nykänen, 2008). EMRs had been primarily designed to collect and store clinical data but developed towards complex systems with many features to support the clinical workflow. Nowadays, in a fully functional EMR, health care professionals should be able to record patient's demographics and clinical data, view investigation outcomes such a laboratory tests and imaging, enter clinical orders including medication prescription and be supported by the system in their clinical decisions (DesRoches et al., 2008)

However, that EMRs allow such functionality does not automatically mean that end-users effectively use these possibilities. On the contrary, as Holden (2010) describes it: 'clinicians do not use available IT, override or work around it, or use only some of the available features'. In order to assess what behavior is desired with respect to EMR use, the concept of 'meaningful use' has been introduced (Blumenthal & Tavenner, 2010). Meaningful use is defined as the use of EMRs in such a way that it contribute to improved quality and safety of care (Classen & Bates, 2011). In order to achieve meaningful use of EMR a set of core objectives, which are considered essential as a start to achieve meaningful use of EMRs, have been defined (Blumenthal & Tavenner, 2010). These objectives include recording patient demographics, maintaining up-to-date lists of the active diagnosis, medication and

medication allergies, using clinical orders for prescription of medication and clinical decision support and the reporting of quality measures (Blumenthal & Tavenner, 2010). Even though these criteria have been developed in 2010, achieving the core objectives still remains ambitious due to the related change in work processes they require (Goveia et al., 2013). These changes include the digital documentation of medical records, the entry of orders in the computer instead of oral orders and digital medication prescription.

In order to come closer to meaningful use of EMR, the need for EMR training has been widely recognized (Blumenthal & Tavenner, 2010; Bredfeldt et al., 2013; Castillo, Martínez-García, & Pulido, 2010; Goveia et al., 2013). The EMR training literature has been focusing mainly on training design as a resource to improve training effectiveness. For example, Younge, Borycki, and Andre (2015) provided an overview of 15 studies describing the training of health care workers in the use of EMRs. The authors gathered information with respect to training design characteristics including types of training and types of training content covered. The type of training is subdivided in training period and training methods. The training efforts were conducted at the orientation, at the implementation or post-implementation. Of the training sessions that were given after implementation, the trainees were more advanced EMRs users, resulting in a more targeted and in-depth training that focused on proficiency and effectiveness (Younge et al., 2015). The methods that were used to provide the training include classroom training, one-to-one training, competency-based training and blended learning. Although no training method could be preferred over the others, the authors suggest that a combination of training methods is most effective. The length of the training sessions varied between two-hour training sessions to eight-hour training days. The training content provided in the programs included various aspects with respect to the use of EMRs of which several could be related to the objectives for meaningful use, such as problem and medication list management and order entry (Bredfeldt et al., 2013), computerized provider order entry (Dastagir et al., 2012), documentation of complex visits and patient history (Goveia et al., 2013). Overall, due to a lack of evidence, no conclusions can be drawn regarding the most effective training design characteristics for EMRs training programs for achieving transfer of training. Furthermore, other factors influencing the effectiveness of EMR training programs, such as trainee characteristics and work environment have not been taken into account.

## 2.2 Learning

In order for any training to be successful, it first requires the learning of new knowledge, skills or attitudes. Only after the trainees have learned the training content, transfer of training can take

place. The following section therefore focuses on the many different views that exist on the concept of 'learning'. These different views can be largely captured in five theories of learning: behaviorism, cognitivism, humanism, social learning and constructivism (Swanson & Holton, 2001) which will be addressed below and summarized in table 1.

*Behaviorism* presumes that there is an objective reality and that learning aims to understand this reality and adjust behavior accordingly (Jonassen, 1994). Desired behavioral changes are the ultimate outcome of the learning process (Swanson & Holton, 2001). This learning model assumes that an individual's behavior is large influences by stimuli from the external environment. *Cognitivism* arose as a response to behaviorism and assumes that reality is created and modified in people's mind based on their own experiences (Jonassen, 1994). Learning entails the ability to develop abstract concepts representing reality and to assign meaning to information (O'loughlin, 1992). This learning model focuses on gaining insight and understanding. Instead of being shaped by the environment, this model assumes that people are capable of influencing the environment (Swanson & Holton, 2001). *Humanism* focuses on the development of the whole individual. Central to humanism is that individuals are seeking self-actualization through learning and that the desire for learning comes from within (Swanson & Holton, 2001). Individuals are viewed as capable of initiating and managing their own learning process. In this learning process the affective aspect is emphasized. The *social learning* model emphasizes the social context in which learning occurs (Swanson & Holton, 2001). This model stresses that individuals learn by interaction with and observation of other people. Learning from role models is an important aspect in the learning process. In contrast to behaviorism, this perspective presumes that learning can occur without behavioral change. *Constructivism* assumes that all knowledge is related to the context and thus that learning cannot be separated from the context in which it should be used (Swanson & Holton, 2001). This model introduced the cumulative nature of learning which entails that in order to retain and use new information, it must be related to existing information and previous experience.

Aspects	Behaviorism	Humanism	Cognitivism	Social learning	Constructivism
<b>View of the learning process</b>	Change in behavior	A personal act to fulfill potential	Information processing	Interaction with and observation of others in a social context	Construction of meaning from experience
<b>Locus of learning</b>	Stimuli in external	Affective and developmental	Internal cognitive	Interaction of person,	Individual and social



	environment	needs	structure	behavior, environment	construction of knowledge
<b>Purpose of education</b>	To produce behavioral change in desired direction	To become self-actualized, mature, autonomous	To develop capacity and skills to learn better	Model new roles and behavior	To construct knowledge

**Table 1: Five learning theories (Merriam, Caffarella, & Baumgartner, 2012)**

In line with the different learning theories, there is also a high diversity in ways in which learning is defined (Hislop, 2013). In this study learning is defined as: A relatively permanent change in knowledge, skills and attitudes of trainees that enables a corresponding change in the trainee's behavior in a given type of situation (Gagne, 1984; Weiss, 1990).

### 2.3 Transfer of training

Once learning has taken place, it is important that the learned material will be used in the work setting. Without this, the training programs fails, even if learning did occur (Kirkpatrick, 2005). Contrary to learning, transfer of training does not occur within a particular training session, but starts once the trainees leave the room at the end of the training, which makes it more challenging. In the literature, this challenge is often referred to as the transfer of training, which could be defined as: *'The degree to which trainees effectively apply the knowledge, skills and attitudes gained in a training context to the job'* (Baldwin & Ford, 1988, p. 63). For transfer to take place it is important that what is learned is applied in the workplace and that the learned knowledge, skills and attitudes are maintained over a period of time.

Transfer of training has been first described by Baldwin and Ford (1988). They developed a framework for understanding the transfer process, consisting of training input factors, training outcomes and conditions of transfer. Conditions of transfer include application of what was learned to the work setting and maintenance of what was learned on the job. The training outcomes compose of the learning and retention of new knowledge, skills and attitudes. Training input factors are the factors influencing the transfer of training and are divided in three broad categories: trainee characteristics, training design and work environment. The factors and relationships within the transfer process are shown in figure 1.

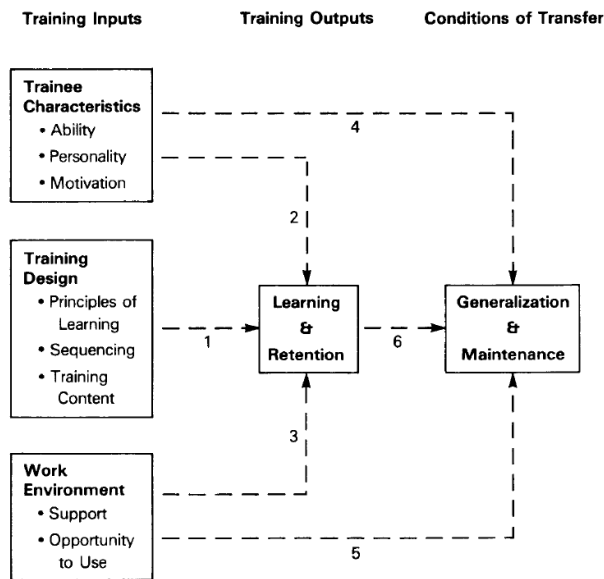


Figure 1: A model of the transfer process (Baldwin & Ford, 1988)

### Trainee characteristics

Baldwin and Ford (1988) identified ability, personality and motivation as trainee characteristics affecting the transfer of training. The *cognitive ability* of trainees refers to being able to understand and apply the learned knowledge and skills (Noe, 1986). Trainees ability has been related to improved retention of complex skills (Day, Arthur Jr, & Gettman, 2001) and has been found to account for 16% of the variance in training effectiveness (Robertson & Downs, 1979). Furthermore, in the meta-analysis of Colquitt, LePine, and Noe (2000), the corrected correlation coefficient between cognitive ability and training transfer was moderately strong at .43. Various *personality* factors, such as self-efficacy, anxiety, and openness to experience have been demonstrated to affect training outcomes. Self-efficacy has been defined as individuals judgments about their competency to perform tasks (Bandura, 1982). Various studies found positive relationships between self-efficacy and transfer generalization and transfer outcomes (Chiaburu & Marinova, 2005; Gaudine & Saks, 2004; Gist, 1989; Mathieu, Tannenbaum, & Salas, 1992). Furthermore, both Noe (1986) and Chiaburu and Marinova (2005) state that self-efficacy positively affects motivation, which in turn influences transfer of training. On the contrary, anxiety has been found to negatively correlate with transfer and training outcomes (Colquitt et al., 2000). Furthermore, in a software training program anxiety resulted in an reduced training motivation (Webster & Martocchio, 1993), thereby indirectly influencing training transfer. Instead, Naquin and Holton (2002) found that trainees with a more positive affectivity are more motivated to learn in order to improve their performance. In addition, trainees that are more open to experience show faster learning outcomes (Herold, Davis, Fedor, & Parsons, 2002). *Motivation* could be defined as: ‘the intensity and persistence of efforts that trainees

*apply in learning-oriented improvement activities'* (Burke & Hutchins, 2007, p. 267). Motivation is known to moderate the relationship between learning and behavior (Noe, 1986). Burke and Hutchins (2007) described three motivation-related constructs that affect transfer of training: pre-training motivation, motivation to learn and motivation to transfer. As described above, these motivation constructs are also influenced by personal characteristics such as self-efficacy and anxiety.

### Training design

Incorporation of learning principles has been an important aspect of research to improve the design of trainings. Baldwin and Ford (1988) identified four basic learning principles to enhance transfer of training: (1) identical elements, (2) teaching of general principles, (3) stimulus variability, and (4) various conditions of practice. The principle of identical elements entails the integration of identical stimulus and response elements in the training and job settings. Teaching general principles include explaining the general rules and theoretical principles underlying the content of the training. Stimulus variability is the use of various examples of the concerning concept in order to see the applicability of the concept in other settings. Conditions of practice are specific design characteristics such as massed or distributed training, whole or part training, feedback and overlearning. In their more recent literature review Burke and Hutchins (2007) included several other training-design related constructs influencing the transfer of training, including learning goals and content relevance. Setting goals could help trainees to know what is expected from them and what behavior is desired. There is evidence that communicating the objectives of a training effort positively influences the training outcomes (Locke, Shaw, Saari, & Latham, 1981; Richman-Hirsch, 2001; Taylor, Russ-Eft, & Chan, 2005). Content relevance draws upon the concept of identical elements and entails that there is consistency between the training content and the task on the job. Empirical research found positive correlations between content transfer and transfer of training (Holton et al., 2000). Axtell, Maitlis, and Yearta (1997) found a correlation of .45 between content validity and transfer outcomes.

### Work environment

In their model, Baldwin and Ford (1988) included two work environment factors, namely support and opportunity to use. In their review Burke and Hutchins (2007) added transfer climate as additional factor and separated support in supervisor support and peer support. Both *supervisory and peer support* have been established to contribute to the transfer of training (Burke & Hutchins, 2007; Clarke, 2002; Huczynski & Lewis, 1980; Martin, 2010). Supportive behavior of supervisors include discussions to use the new knowledge and skills, their involvement in training and positive feedback to the trainee (Lim & Johnson, 2002). Examples of peer support behaviors that positively affect transfer are networking with peers, sharing ideas about training content (Hawley & Barnard, 2005)

and peer meetings (Martin, 2010). In addition to support the transfer of training could be facilitated by providing the *opportunity to perform*, which could be defined as *'the extent to which a trainee is provided with or actively obtains work experiences relevant to the tasks for which he or she is trained'* (Ford, Quiñones, Sego, & Sorra, 1992, p. 512). Opportunity to perform may be considered a hygiene factor, without the ability to practice what is learned on the job, transfer of training is limited. Indeed, lack of *opportunity to perform* the trained knowledge and skills has been found to be the biggest barrier to transfer (Clarke, 2002; Lim & Johnson, 2002). *Transfer climate* refers to practices and procedures that may facilitate or inhibit the use of learned knowledge and skills on the job (Rouiller & Goldstein, 1993). Transfer climate may be described as supportive or unsupportive (Burke & Baldwin, 1999). Characteristics of a supportive transfer climate include opportunities that prompt trainees to use the learned knowledge and skills, incentives for using the new skills correctly (Rouiller & Goldstein, 1993), a positive attitude of employees toward training programs and the existence of formal training policies and practices that support training programs (Burke & Baldwin, 1999). Transfer climate is found to influence transfer of training both directly (Lim & Morris, 2006; Mathieu et al., 1992) and indirectly as moderator between individual and situational factors and transfer of training (Burke & Baldwin, 1999). Colquitt and colleagues found a moderately high corrected correlation coefficient of .37 between training climate and transfer of training (Colquitt et al., 2000).

## 2.4 Training evaluation

Training evaluation could be defined as *'the systematic collection of descriptive and judgmental information necessary to make effective training decisions related to the selection, adoption, value and modification of various instructional activities'* (Goldstein, 1980). Evaluations can be performed for several purposes: providing feedback by linking training outcomes to training goals, having control by gaining insight in the cost-effectiveness, gathering data for research with respect to learning, training and transfer of training, and offering opportunities for interventions (Rajeev, Madan, & Jayarajan, 2009). Although evaluation is a very useful and important activity, performing an evaluation is a complex process. To reduce the complexity of this process it could be useful to focus on the main objective of an evaluation: the evaluation of the process (formative evaluation) or the evaluation of the outcome (summative evaluation) (Wang & Wilcox, 2006). The former focuses on the who the training program was implemented, the latter assesses whether the training has achieved the desired outcome (Rajeev et al., 2009). In this research the objective is to evaluate the effect of a trainings program, thus it entails a summative evaluation.

The most widely used framework to evaluate training programs outcomes in organizations is Kirkpatrick's four-level evaluation model. The model provides a systematic approach to assess the effect of training by breaking down the evaluation into four levels of training outcomes: reaction, learning, behavior and results (Kirkpatrick, 1967). Reaction, the first level, evaluates how satisfied trainees are with the training program. In other words, it is an evaluation of the participants' feelings and perceptions of the training (Rajeev et al., 2009). This level is often measured using an evaluation form at the end of the training which gives participants the possibility to value different aspects of the training such as the content of the training, the manner in which the content was presented, the instructor and the length of the training (Galloway, 2005). The second level, learning outcomes addresses the amount of actual learning that has taken place as a result of the training program. This learning could have contributed to knowledge and understanding of facts, concepts, principles and techniques, acquisition or improvement of skills and/or changes in attitude (Kirkpatrick, 2005). Learning could be measured by self-assessment or by computer-based performance testing (Galloway, 2005). Behavior measures, level three, assess to what extent the acquired knowledge, skills and attitudes are applied on the job. In other words, it captures whether job performance has improved as a result of the training. The last level, results focuses on the organizational outcomes of the training. These results often include financial measures such as cost reduction, profit increase and return on investment, for example by making EMR use less time consuming.

The popularity of this model has been largely gained due to the simplicity of the model: it reduces the complex process of evaluation into four distinct outcome measurement levels (Bates, 2004). Furthermore, the model has provided a language to talk about training evaluation in a time period that the vocabulary for this subject was hardly there (Kirkpatrick, 2005). This resulted in a more systematic and generalized approach to evaluate training programs. Finally, the wide applicability of the model made it useful in many organizations, resulting in widespread use. However, Kirkpatrick's model has also been subject to scientific scrutiny. The main critique entails that the model is considered incomplete (Aldrich, 2002; Bates, 2004; Kaufman & Keller, 1994). The model focuses merely on the evaluation of the training itself and does not take into account organizational, individual and training-related factors influencing the effect of the training (Bates, 2004). In addition, Holton (1996) argues that the absence of major intervening variables is a shortcoming of the four-level evaluation model. Another aspect that has been criticized concerns the implicit assumption of hierarchical causality, which entails positive reactions result in better learning, which lead to a greater transfer into behavior, causing better organizational outcomes. Thus each level could be seen as a causal determinant for the next level. However, there is little empirical evidence for these causal relationships (Alliger & Janak, 1989). Holton (1996) states that in order to draw causal

conclusions a more enhanced model is needed. He argues that in case of absence of positive training outcomes, the only conclusion that could be drawn based on Kirkpatrick's model is that the training program is not effective. Instead, when several influencing factors are taken into account, causes outside the training program may emerge (Holton, 1996). In response to the critique on the Kirkpatrick model and based on the Rouiller and Goldstein (1993) instrument, Holton (1996) developed the 'HRD Evaluation Research and Measurement Model', which elaborates on the four-level evaluation model by including factors that influence training outcomes. This model is presented in figure 2 and forms the basis for the evaluative instrument used in this thesis.

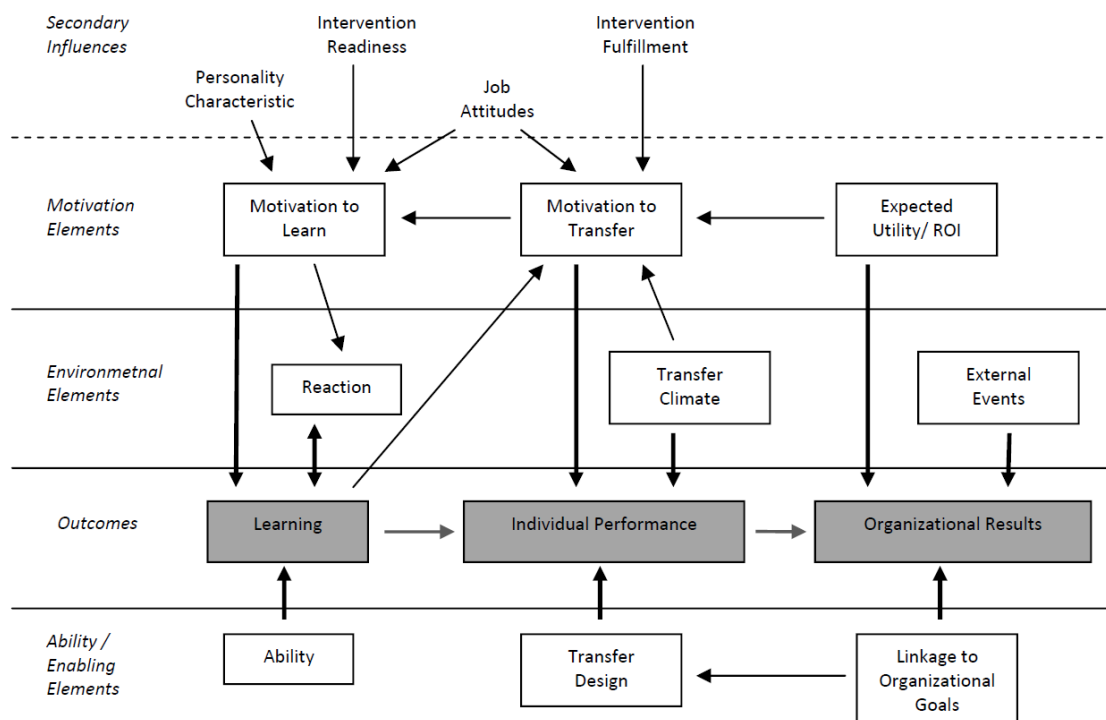


Figure 2: HRD Evaluation Research and Measurement model (Holton, 1996)

This model assumes that training outcomes are affected by ability, motivation and environment at three outcome measures: learning, individual performance and organizational results (Holton, 2003) of (Holton & Baldwin, 2003). These outcome measures are based on Kirkpatrick's evaluation model and defined, respectively, as: *'achievement of the learning outcomes desired in an HRD intervention; change in individual performance as a result of the learning being applied on the job and results at the organizational level as a consequence of the change individual performance'* (Holton, 1996). In contrast with the four-level evaluation model, reaction is not considered a primary outcome due to the lack of evidence for a linear relationships between reaction and learning (Alliger & Janak, 1989; Dixon, 1990; Warr & Bunce, 1995). The categories of influencing factors have large similarity with the training input factors in the model of the transfer process by Baldwin and Ford (1988). As addressed before, Baldwin and Ford (1988) indicate that transfer of training is influenced by trainee

characteristics, training design and work environment. The factors that Baldwin and Ford (1988) named trainee characteristics match with ‘motivation elements’ in Holden’s model. Training design corresponds with what Holton (1996) considers ‘ability elements’. Both models included a group of factors about the work environment. In his model Holton (1996) added a fourth category of factors, which called ‘secondary influences’. These secondary influences have an impact on the motivation to learn and the motivation to transfer.

Based on the HRD Evaluation research and measurement model, Holton, Bates, Seyler, and Carvalho (1997a) developed a transfer climate instrument consisting of nine factors: peer support (7), supervisor support (8), supervisor sanction (9), positive personal outcomes (10), negative personal outcomes (11), resistance/openness to change (12), content validity (13), transfer design (14) and opportunity to use (16). In the subsequent years, this instrument had been further expanded, leading to a new model with seven additional factors: learner readiness (1), performance self-efficacy (2), motivation to transfer (3), transfer effort-performance expectations (4), performance outcomes expectations (5), feedback (6) and personal capacity for transfer (15) (Holton et al., 2000). This resulted in the Learning Transfer System Inventory (LTSI) consisting of sixteen factors of which eleven factors are related to a specific training program and five factors are related to training in general. The LTSI is shown in figure 3.

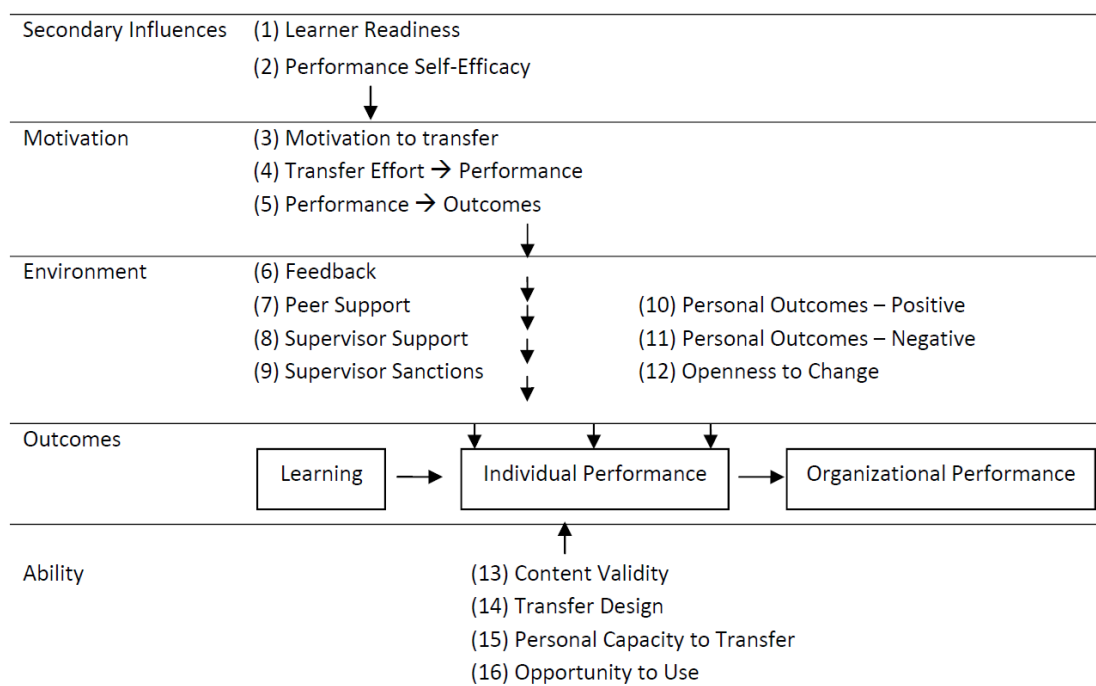


Figure 3: The Learning Transfer System Inventory (Holton et al., 2000)

## 2.5 Motivation to transfer

Motivation to transfer is regarded as a key factor within the training transfer process: without motivation to transfer, even the best training could fail because participants can simply choose not to apply what was learned. Noe (1986), p. 503) defined motivation to transfer as the trainee's desire to use the knowledge and skills acquired in the training program on the job. In other words, motivation to training can be considered as the degree to which trainees have the behavioral intention to apply what was learned in the training program on the job (Axtell et al., 1997; Bates, Kauffeld, & Holton, 2007; Cheng & Hampson, 2008). Kirwan and Birchall (2006) tested the interrelationships between factors of the LTSI and revealed motivation to transfer as crucial variable, having the most significant relationships within the learning transfer system. Other empirical studies confirmed that most of the variance in transfer of training could be attributed to motivation to transfer (Bates et al., 2007; Kauffeld, Bates, Holton III, & Müller, 2008). Elaborating on this, more recent research indicated a mediating role of motivation to transfer between the other learning transfer system factors and transfer of training (Bhatti, Battour, Sundram, & Othman, 2013; Gegenfurtner, Veermans, Festner, & Gruber, 2009; Grohmann et al., 2014; Massenberg et al., 2016).

Motivation to transfer was found to predict the rate of behavioral change in the training transfer setting (Huang, Ford, & Ryan, 2016). Furthermore, the work of Axtell et al. (1997) showed that motivation to transfer predicted transfer of training both on the short term and on the long term. Therefore, in this study motivation to transfer was used as the primary outcome measure to predict transfer of training. This was also recommended by Bauer, Orvis, Ely, and Surface (2016), who stated that motivation to transfer provides the best prediction of distal post-training outcome measures compared to other motivation types (e.g. intrinsic motivation, motivation to learn and expectancy motivation).

## 2.6 Hypotheses

In this study the following factors have been assessed that together could be described as transfer system factors: learner readiness, efficacy beliefs, feedback, training, design, negative personal outcomes, opportunity to use, peer support and resistance to change. The hypotheses have been described below.

### Training design

The factor training design is composed of transfer design and content validity. These aspects together refer to the alignment between the training design and the job requirements.



Motivation to transfer has been found to develop during training (Yelon, Sheppard, Sleight, & Ford, 2004). A large number of intervention design strategies have shown to affect transfer of training, such as goal-setting, action planning and variable training stimuli (Gegenfurtner et al., 2009; Kirwan & Birchall, 2006). These design strategies are methods to achieve alignment in the transfer design, that is: “ *The degree to which training has been design and delivered to give trainings ability to transfer learning to the job and training instructions match job requirements*” (Holton et al., 2000, p. 345). Transfer design has been shown to have a positive effect on motivation to transfer (Massenberg et al., 2016). Another important aspect of the training design is the content validity, which entails the degree to which the training content matches the job requirements. Kontoghiorghes (2002) in his study indicated that trainee are more motivated to transfer when they are expected to use the training in the workplace. Finally, Grohmann et al. (2014) described the mediating role of motivation to transfer in the relationship between transfer design and training transfer and in the relationship between content validity and training transfer. In conclusion, the first hypothesis formulated here is:

*H1: Training design positively influences motivation to transfer, that is, trainees who perceive a better alignment between the training design and job requirements are more motivated to transfer.*

#### Negative personal outcomes

The factor negative personal outcomes represents the degree to which trainees believe that not applying the training content on the job leads to negative outcomes for the trainee (Holton et al., 2000). In other words, whether the trainee expects to receive negative consequences such as sanctions or punishment when not using what was learned in the training in the work setting. Rouiller and Goldstein (1993) in their study already described this concept as consequences, which was considered a part of the organizational transfer climate that significantly related to transfer of training. Moreover, Kontoghiorghes (2002) found that motivation to transfer is high when trainees are being accountable for the training application. This implies that when the training is not applied this could lead to negative outcomes. Consistent with this, negative personal outcomes have been shown to positively affect motivation to transfer (Ruona, Leimbach, Holton, & Bates, 2002). This results in the following hypothesis:

*H2: Expected negative personal outcomes positively affect motivation to transfer, that is, trainees who expect more negative personal outcomes are more motivated to transfer*

#### Resistance to change

For actual transfer of training, the newly learned skills and knowledge have to be applied on the workplace, which entails a change in behavior on the job. This behavioral change requires openness

to change; on the contrary it is likely that resistance to change in the workgroup limit changes in job behavior. There are many different conceptualizations of resistance to change (Piderit, 2000), but in this study resistance to change indicates ‘*the extent to which prevailing group norms are perceived by individuals to resist or discourage the use of skills and knowledge acquired in training*’ (Holton et al., 2000, p. 346). The role of perceived group was confirmed by Kirwan and Birchall (2006) who found that resistance to change inhibit the motivation to transfer. Moreover, change resistance has been shown to be a significant predictor of transfer of training (Bates, Holton, Seyler, & Carvalho, 2000). This results in the following hypothesis:

*H3: Perceived resistance to change negatively influences motivation to transfer, that is, trainees who perceive their group norms are more resistant to behavioral change are less motivated to transfer.*

#### Learner readiness

Learner readiness is the extent to which trainees are prepared to participate meaningfully in the training (Holton et al. 2003). This preparation includes that trainees are informed about the training content and how it affects job performance, alignment between the training and job development and what to expect from the training. It is likely that if a trainee is better prepared for the training he or she will be more motivated to transfer the training. This is confirmed in the work of Kirwan and Birchall (2006) that indicated that learner readiness directly affects motivation to transfer. In a similar study, Massenberg et al. (2016) found that learner readiness has a significant influence on motivation to transfer both before and after the training. In addition, researchers have shown that the more prepared the employee is, the more likely he or she is motivated to apply the acquired skills and knowledge (Bhatti et al., 2013; Payne, Flynn, & Whitfield, 2008). This results in the following hypothesis:

*H4: Perceived learner readiness positively influences motivation to transfer, that is, trainees who feel better prepared for the training are more motivated to transfer.*

#### Opportunity to transfer

The opportunity to transfer includes the personal capacity of trainees to transfer and the opportunity to perform. The personal capacity to transfer refers to the degree to which trainees have the time, energy and cognition in their job to make the changes required to transfer (Holton et al., 2000). Kirwan and Birchall (2006) found a strong relation between personal capacity to transfer and motivation to transfer. The opportunity to perform entails the degree to which trainees have the resources and tasks that enable them to apply what was learned on the job (Holton et al., 2000). In the study of Kontoghiorghe (2002) trainees were more motivated when they were provided with learning and advancements opportunities. Several other studies confirmed the finding that

opportunity to use positively affect motivation to transfer (Kirwan & Birchall, 2006; Massenberg et al., 2016; Seyler, Holton, Bates, Burnett, & Carvalho, 1998). This results in the following hypothesis:

*H5: Expected opportunity to transfer positively influences motivation to transfer, that is, trainees who expect to have more opportunities to transfer are more motivated to transfer*

#### Efficacy beliefs

Efficacy beliefs concern both self-efficacy and instrumentality. In this setting self-efficacy represents a trainee's belief that they are able to change their behavior. Instrumentality refers to a trainee's belief that behavioral change will lead to desired outcomes. These concepts are based on the social cognitive theory (Bandura, 2001), and it has been widely established that these efficacy beliefs are antecedents for training motivation (Axtell et al., 1997; Chiaburu & Lindsay, 2008; Colquitt et al., 2000; Kirwan & Birchall, 2006; Seyler et al., 1998). For example, the study of Kirwan and Birchall (2006) indicated that a higher level of self-efficacy enables motivation to transfer. This also holds for a computer-based training, where computed confidence has found to have a positive relation on motivation to transfer (Seyler et al., 1998). Also, it is found that self-evaluation is an important factor in the decision to transfer (Yelon et al., 2004). Besides, Chiaburu and Lindsay (2008) found training instrumentality as a primary predictor for motivation to transfer. Moreover, Colquitt et al. (2000) indicated that both self-efficacy and instrumentality relate to transfer of training via motivation to transfer. Finally, also the recent study of Massenberg et al. (2016) found a positive relation between self-efficacy and motivation to transfer and between instrumentality and motivation to transfer. This results in the following hypothesis:

*H6: Efficacy beliefs positively influences motivation to transfer, that is, trainees who have higher efficacy beliefs are more motivated to transfer.*

#### Feedback

Work environment factors are considered significant in the transfer of training. One of these factors is feedback, which could be defined as “*formal and informal indicators from an organization about an individual's job performance*” (Holton et al., 2000, p. 346). Receiving feedback provides the trainee with information to compare the current and the desired behavior. This enables the trainee to adjust their behavior and thereby motivates the trainee to invest further efforts (Van den Bossche et al., 2010). Several studies have found empirical evidence that feedback positively affects motivation to transfer (Bates & Holton, 2004; Gegenfurtner et al., 2009; Kirwan & Birchall, 2006). It should be noted that not the feedback itself, but how feedback is individually perceived influences motivation to transfer (Gegenfurtner et al., 2009). This results in the following hypothesis:

*H7: Perceived feedback positively influences motivation to transfer, that is, trainees who perceive more feedback are more motivated to transfer.*

#### Peer support

Another important work environment factor is peer support. This specific form of social support refers to the degree to which colleagues reinforce and support the application of what was learned on the job (Holton et al., 2000). This included activities such as peer meetings and sharing experiences about the training content, which help the trainee to familiarize with the training content. Kirwan and Birchall (2006) found that from the work environment factors, peer support contributes most to motivation to transfer. Peer support was confirmed by several studies as positive predictor of motivation to transfer (Bates et al., 2000; Grohmann et al., 2014; Massenberg et al., 2016; Seyler et al., 1998). This results in the following hypothesis:

*H8: Perceived peer support positively influences motivation to transfer, that is, trainees who perceive more peer support are more motivated to transfer.*

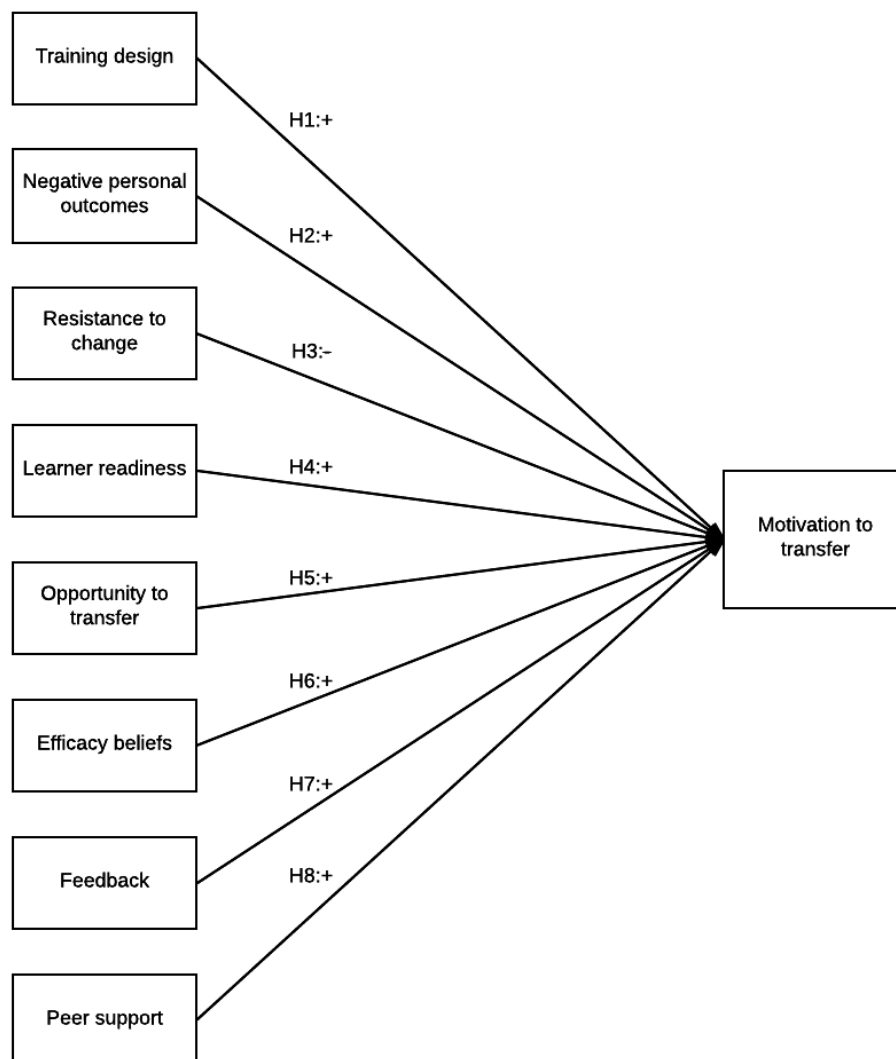


Figure 4: Hypothesized model

## Chapter 3 Methods

### 3.1 Setting

This research was conducted in the Radboud University Medical Centre (Radboudumc). The Radboudumc is an academic hospital employing over 10.000 health care workers and providing care for 953 beds distributed over 52 medical departments. Their mission is 'to have a significant impact on healthcare'. The Radboudumc strives for this mission by means of four ambitions, namely participatory and personalized healthcare, demonstrable distinctive quality, effective and efficient use of resources and sustainable networking with partners. For the realization of these ambitions the use of modern health information technology is essential. Part of this strategy was the implementation of a new EMR, called Epic, in October 2013. The old IT services consisted of several applications that were sometimes old fashioned, usually high in maintenance costs and hardly compatible with each other, resulting in low transparency of patient data. Instead, Epic is a modern EMR collecting all health information around the patient in one system thereby connecting care, research and quality. This EMR offers several new features, such as computerized physician order entries, clinical decision support and drug-drug interaction checks. However, more than two years after the implementation of the new EMR, the use of the EMR differs widely among users resulting in information being documented in different places which makes it hard for other users to find this information (Joint Commission International, 2016). Moreover, the quality of registration is often insufficient, for example discharge summaries are often lacking or incomplete (Joint Commission International, 2016). Furthermore, current training opportunities do not fit the needs of the physicians. Therefore, a new training program was developed, which is addressed below.

#### Training program 'PLEZIER'

Four ear, nose and throat (ENT) specialists with advanced EMR skills developed a training program based on their own experiences with Epic. The training program is called 'PLEZIER', which is an abbreviation of the Dutch translation of 'patient-centered care, workload reduction and health care innovation through Epic in the Radboudumc'. This training program has two final goals: to reduce the administrative burden of physicians by increasing their proficiency with the EMR and to increase the quality of care through an increased quality of registration. The ENT specialists have presented the training program to the physicians of different medical departments in the Radboudumc. The first departments that decided to join the program included neurology, hematology, rheumatology, pediatrics and dental, oral and maxillofacial surgery and were therefore included in this study.

Before the actual training sessions took place, several preparatory steps have been taken. First, the ENT specialists had three meetings with members from the departments to assess their entry-level of EMR use. The entry-level forms the starting point for the next step: a meeting where one or two ENT specialists educate three physicians from the joining department on how to customize the design of the EMR to make it best suitable for their department. This customization includes the development of standard letters, preference orders and smart phrases. This customization includes the development of standard letters, preference orders and smart phrases. Standard letters are letters that have a standard format in which patient-specific information could be automatically added once this information is documented in the EMR. Preference orders are frequently used digital commands in which the required options are already selected. Smart phrases are templates of frequently used phrases that can be written down automatically by use of a shortcut. These customized possibilities have been created before the training sessions for all physicians from the neurology department. Training sessions were organized at different time slots, from April 13<sup>th</sup> to August 31<sup>st</sup>. The training sessions were led by at least one ENT specialist and who was assisted by an Epic expert from the Radboudumc. Each physician had a computer at his or her disposal during the training. The training could be seen as a tips and tricks training and covered the following aspects: installing, editing and using efficiency tools, use and adjustments of preference order list, easy registration of physician in charge, use of standard letters, smart phrases and shortcuts and modification of patient overview.

### 3.2 Research design

The objective of this study is to contribute to the theory regarding effective EMR training by linking learning transfer system factors to EMR training effectiveness at the Radboudumc. This objective fits with theory-oriented research, which according to Verschuren and Doorewaard (2010, p. 42) theory-oriented research contribute to *'solving a problem encountered in the theory development in a particular scientific area'*. In order to achieve this aim, a quantitative, empirical study has been conducted at the Radboudumc. To collect data, amongst others, a survey has been used, which provides a broad overview of a comprehensive phenomenon (Verschuren & Doorewaard, 2010). For the use of a survey it is necessary to reduce the reality to a set of variables (Verschuren & Doorewaard, 2010). On the one hand this requires a simplification of reality and thereby loss of in depth knowledge. On the other hand, this reduction enables to determine statistical relationships between the variables (Verschuren & Doorewaard, 2010). Furthermore, data collected by a survey can be grouped based on characteristics and comparisons between these groups can be drawn (Vennix, 2010). A disadvantage of a survey is the usually low response rate, which makes the

outcomes less reliable. To reduce the bias from a low response rate, participants were offered time directly after the training program to fill in the questionnaire.

### 3.3 Study population

All employees attending the training program between 13<sup>th</sup> of April and 31<sup>st</sup> of August were invited to participate in this study. In total 129 employees participated in the training program, of which 102 responded to the questionnaire, giving a response rate of 79%. The participants were 39.7 years of age on average (SD = 10.3, 7.8% not specified) with a minimum of 25 years and a maximum of 63 years. Most participants were female (35.3% male, 64.7% female), which is quite common in the health care sector. More than half of the participants were medical specialists (52.9%), most of the rest were residents (42.2%) and merely a few nurse practitioners participated in the training (4.9%). The average tenure in terms of being employed in their current function was 8.0 years (SD 8.1, 7.8% not specified)

### 3.4 Measures

In this study is the effect of transfer system factors on motivation to transfer in an EMR training program evaluated. The operationalization of these measures is discussed below.

#### Transfer system factors

The transfer system factors are based on the Learning Transfer System Inventory (LTSI), which is a questionnaire designed to measure individual perceptions of factors affecting the transfer of training to the work setting (Bates, Holton, & Hatala, 2012). The factors are measured using the related items from the LTSI, which are measured using five-point Likert scale items ranging from strongly disagree (1) to strongly agree (5). Participants are requested to score the items that relate to how they perceive the different transfer system factors. For instance, for the factor learner readiness participants are asked to assess to what extent they experienced they were well prepared for the training by rating items such as 'Before the training I had a good understanding of how it would fit my job-related development'. The factor training design highlights whether trainees experienced a good fit between the training content and the job requirements. The factor negative personal outcomes addresses whether participants believe there will be negative consequences of not applying the training content. The factor resistance to change entails whether trainees perceive their work group as not open to behavioral change in the workplace. The factor opportunity to transfer includes whether the participants expect to have possibilities to apply the training content on the job. The factor efficacy beliefs indicates whether trainees have confidence in their own capabilities

and in reward for their effort to transfer the training content. The factor feedback highlights whether trainees experience to receive frequent feedback on how to improve their job performance. The factor peer support measures whether trainees experience support from their colleagues in applying the training content on the job.

The original English version of the LTSI has been translated to Dutch using a forward-back translation. This means that first the English text has been translated to Dutch and second another translator converted the Dutch text has been back to English to assess whether the original meaning of the items has been maintained.

The data gathered from the paper questionnaires have been put into SPSS (SPSS version 22, IBM, New York, USA), in order to analyze the collected data. Before performing the analysis in SPSS, the data have been transformed to be suitable for the analysis. This transformation includes inversely scored items being reversed to normal items. A principal axis factor analysis with oblique rotation was carried out on the 27 items concerning the items specific for the EMR training. For the items concerning training in general a principal component analysis was carried out since SPSS was unable to run a principle axis factoring. The number of factors was based on Kaiser's criterion of eigenvalues greater than 1 and the inflexion on the scree plot. After the initial analysis, the output was checked for communalities greater than  $|.20|$  and double loaders greater than  $|.20|$ . However, before deletion of any item, the content validity has been taken into account. The factor analysis revealed six training specific factors, which could best be described as: training design, negative personal outcomes, learner readiness, opportunity to transfer, peer support and motivation to transfer. The factor training design is consisted of items from content validity and transfer design. The factor negative personal outcomes is composed of two of the three original items. The factors motivation to transfer, learner readiness and peer support maintained their original three items. The factor opportunity to transfer is composed of items from personal capacity and opportunity to use. The component analysis indicated three general factors, which could be reported as resistance to change, efficacy beliefs and feedback. The factors resistance to change and feedback maintained their original three items. The factor efficacy beliefs is composed of items from performance- outcomes expectations and performance self-efficacy. To assess the reliability, Cronbach's alpha was used, which is the most common measure scale for reliability (Field, 2013)

The Cronbach's alpha for all nine factors are shown in table 1 and were greater than .60 for each factor which indicates sufficient reliability according to Field (2013). Second, a correlation analysis has been performed to determine the correlations between the items per factor.



<b>Factor</b>	<b>Cronbach's alpha</b>
<b>Motivation to transfer</b>	.694
<b>Training design</b>	.781
<b>Negative personal outcomes</b>	.849
<b>Resistance to change</b>	.636
<b>Learner readiness</b>	.871
<b>Opportunity to transfer</b>	.793
<b>Efficacy beliefs</b>	.648
<b>Feedback</b>	.775
<b>Peer support</b>	.670

**Table 2: reliability of the factors**

To assess the effect of the transfer system factors on motivation to transfer, a multiple regression analyses had been carried out. Missing values regarding the control variables, such as age, have been replaced by the mean. With respect to missing values on the transfer system items it appears that most cases with missing values had been missing values on half of the questionnaire. By replacing all these missing values by the mean, this would affect the reliability of the measures. Therefore, missing values on the transfer system items have been replaced by mean if the missing values concerned only one of the items per factor. If more than one item per factor was missing, the case was not included in the analysis. This resulted in N=97 for this analysis. The data has been checked for violation of the assumptions, which indicated as only violation a non-linear relationship between negative personal outcomes and motivation to transfer, which have been corrected for by creating a compound variable.

#### Control variables

Besides the transfer system factors a number of control variables were included because of the potential influence on motivation to transfer. Previous research revealed differences in the motivation to transfer between men and women, and between older and younger trainees (Colquitt et al., 2000). Therefore, gender (coded as 1=men, 2=women) and age (years) have been included in this study as control variables. Moreover, it could be assumed that job involvement and work ethic differ per function and department, which in turn have been shown to influence motivation to transfer (Naquin & Holton, 2002). Thus, function (coded as 1= medical specialist, 2=resident) and department (coded as 1= internal medicine, 2=other) were included in the analysis as control variables. The difference between internal medicine and other specialties was made since different subspecialties share half of their specialty-training program and have similar job requirements. Moreover, trainees from internal medicine represented almost half of the sample in this study.

### 3.5 Research ethics

Conducting research with human participants inevitably involves ethical considerations that have to be taken into account. During the research period the researcher was not only at the Radboudumc to conduct this study but also had an internship at the department 'Procesverbetering en Innovatie' (PVI). The PVI department was slightly involved in the project PLEZIER by making the connection with related projects that also aim to improve the quality of care through improvements in guidelines and registration agreements. The researcher was not directly involved in the project PLEZIER or related projects. Furthermore, the researcher is also physician and had used the EMR of the Radboudumc herself during a medical internship two years ago. This experience with the EMR might have influenced her perception regarding the ease of use of the EMR and the best way to register. However, the experience with the EMR was in an inpatient setting, whilst this research focuses on EMR use in the outpatient setting, which makes it less likely that previous experience from the researcher with the EMR has substantially affected the research outcomes. What might have influenced the perception of the research is the collaboration with one of the ENT specialists who was the leader of the training program PLEZIER. He had a clear perspective on the causes of insufficient EMR use and how to address these causes. Although his clear perspective was very useful it also involves the risk of overlooking other influential factors. This risk was partially avoided by the use of an existing survey instrument.

At the end of the training, the physicians were informed about the research. Physicians were invited to participate in this study but it was emphasized that participation is completely voluntary. Additionally, it was emphasized that all gathered data was treated as confidentially, and that before analysis the data from the survey were recoded to make sure that the data is not traceable to individual participants in order to protect their privacy. Participants did have to fill in some personal questions in order to obtain data about the control variables.

## Chapter 4 Results

Means, standard deviation and correlations between variables are presented in table 3. Of the control variables function and department had a significant relation with motivation to transfer ( $r = .23$ ,  $p < .05$  and  $r = .20$ ,  $p < .05$  respectively). The covariates age and gender did not correlate significantly with motivation to transfer.

Variable	Mean	SD	1.	2.	3.	4.	5.	6.	7.	8.
<b>Motivation to transfer</b>	3.75	0.56	-							
<b>Training design</b>	4.05	0.45	.40***	-						
<b>Negative personal outcomes</b>	1.98	0.77	.35***	.25**	-					
<b>Resistance to change</b>	2.44	0.66	.02	-.03	.10	-				
<b>Learner readiness</b>	2.80	0.80	.22*	.28**	.14	.06	-			
<b>Opportunity to transfer</b>	3.66	0.58	.27**	.41***	.03	-.04	.04	-		
<b>Efficacy beliefs</b>	3.49	0.46	.22*	.23*	.02	-.13	.18	.28**	-	
<b>Feedback</b>	2.66	0.65	.11	.12	.13	-.32**	.12	.08	.11	-
<b>Peer support</b>	3.47	0.56	.27**	.19*	.21*	-.06	.29**	.02	.07	.32**

**Table 3. Means, standard deviations and correlations between transfer system factors; \* $p < .05$ ; \*\* $p < .01$**

The results for the hypothesized model are presented in table 2. The model is useful ( $F(12,84) = 3.783$ ,  $P < .001$ ) and explains 35% of the variance in motivation to transfer ( $R^2 = .351$ ,  $\text{Adj } R^2 = .258$ ). The first hypothesis predicted a positive relationship between training design and motivation to transfer. In contrast to hypothesis 1, no significant relationship was found between training design and motivation to transfer. The second hypothesis addressed whether expected negative personal outcomes positively affect motivation to transfer. Supporting this hypothesis, expected negative personal outcomes had a significant positive relationship with motivation to transfer ( $b = .28$ ,  $p < .01$ ). The third hypothesis indicated that perceived resistance to change has a negative influence on motivation to transfer. Inconsistent with hypothesis 3, no significant relationship of perceived resistance to change on motivation to transfer has been found. The fourth hypothesis predicted that perceived learner readiness has a positive influence on motivation to transfer. This hypothesis had to be rejected since no significant relationship was found between learner readiness and motivation to transfer. The fifth hypothesis focused on the effect of expected opportunity to transfer on motivation to transfer. In contrast to hypothesis 5, no significant relationship was found between expected opportunity to transfer and motivation to transfer. The sixth hypothesis addressed whether efficacy

beliefs positively affect motivation to transfer. Supporting this hypothesis, a significant positive relationship was found between efficacy beliefs and motivation to transfer ( $b = .17, p < .05$ ). The seventh hypothesis predicted a positive influence from perceived feedback on motivation to transfer. Inconsistent with hypothesis 7, there was no significant influence found from perceived feedback on motivation to transfer. The eighth hypothesis predicted that perceived peer support positively affect motivation to transfer. This hypothesis was confirmed, since perceived peer support was found to have a significant positive effect on motivation to transfer. In conclusion, support has been found for hypothesis 2, 6 and 8, whereas hypothesis 1, 3, 4, 5 and 7 had to be rejected.

In other words, the results indicate that if trainees expect to have more negative personal outcomes from not applying the training content on the job, they are motivated to transfer the training. Furthermore, if trainees have a higher belief in their own capabilities to change their behavior and that these behavioral changes lead to desired outcomes, their motivation to transfer is higher. Finally, the more support trainees experience from their peers, the more motivated to transfer they are.

<b>Variables</b>	<b>B</b>	<b>Beta</b>
<b>(Constant)</b>	0,695	
<b>Gender</b>	0,014	.012
<b>Department (internal medicine vs. other)</b>	0,279	.247*
<b>Age</b>	-0,007	-.132
<b>Function</b>	1	.095
<b>Training design</b>	0,221	.178
<b>Negative personal outcomes</b>	1	.282**
<b>Resistance to change</b>	0,015	.017
<b>Learner readiness</b>	0,001	.002
<b>Opportunity to transfer</b>	0,091	.094
<b>Efficacy beliefs</b>	0,205	.167*
<b>Feedback</b>	-0,004	-.005
<b>Peer support</b>	0,245	.246*

Table 4: Multiple regression analysis. \*  $p < .05$  \*\*  $p < .01$ , one-tailed

An overview of the significant relationships within the hypothesized model can be found in figure 1. In the multiple regression analysis, only the covariate department significantly affected motivation to transfer, to the effect that physicians from an internal medicine department were less motivated to transfer compared to their colleagues from another department ( $b = .247$ ,  $p < .05$ ).

Figure 5

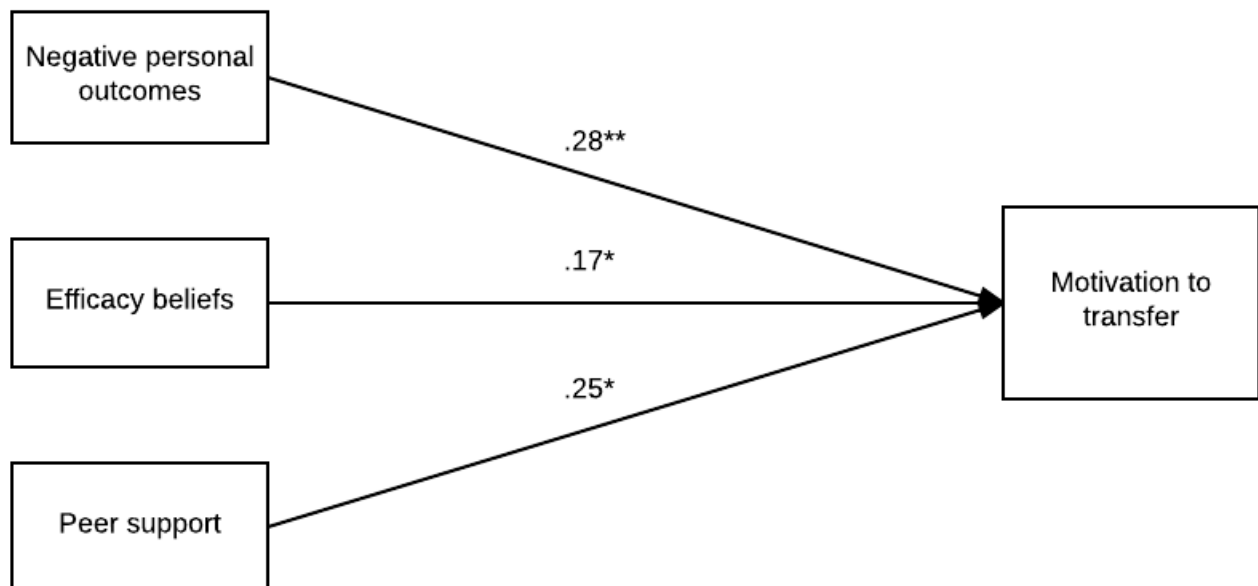


Figure 5: Final model, \*  $p < .05$  \*\*  $p < .01$ , one-tailed

## Chapter 5 Discussion

### 5.1 Summary of findings

This study started with the need for EMR training in order to achieve appropriate EMR use, which in turn could improve the quality and safety of health care. To contribute to this high-end goal, this study combines two strands of literature: on the one hand EMR training and on the other hand transfer of training. As a part of transfer of training process, motivation to transfer has been found to play a crucial role (Axtell et al., 1997; Kirwan & Birchall, 2006). In order to identify the essential factors in the transfer of EMR training, the objective of this study was to analyze which transfer system factors affect motivation to transfer in an EMR training program.

The findings distinguish three significant transfer system factors influencing motivation to transfer, of which negative personal outcomes ( $b = .28$ ) had the strongest influence on motivation to transfer, followed by peer support ( $b = .25$ ) and efficacy beliefs ( $b = .17$ ). Additionally, the results suggest that both factors related to the specific training program (negative personal outcome and peer support) and a factor related to training in general (efficacy beliefs) affect motivation to transfer.

Furthermore, two of those factors concern the work environment (negative personal outcomes and peer support), which is in line with findings of the study by Seyler et al. (1998) in which environmental factors explained most of the variance.

The results indicate that trainees who believe that their peers expect them to apply the training content and experience support from their peers are more motivated to transfer. This finding is consistent with the study of Grossman and Salas (2011) who stated that social support is one of the most important factors in facilitating transfer of training. Several studies have confirmed the positive impact of peer support on motivation to transfer (Massenberg et al., 2016; Seyler et al., 1998; Van den Bossche et al., 2010). Bandura's social cognitive theory (1989) already highlighted the crucial role of self-efficacy beliefs by mediating almost all other factors affecting behavior. Therefore, self-efficacy beliefs are to a large extent an excellent predictor of behavioral choices (Pajares, 1996). This study confirmed the positive influence from efficacy beliefs on motivation to transfer, which is consistent with previous research (Massenberg et al., 2016; Ruona et al., 2002).

In this study the variable negative personal outcomes has been revealed as an important factor affecting motivation to transfer. It is interesting to note that in several other studies assessing the influence of several LTSI factors on motivation to transfer, negative personal outcomes have not been found to affect motivation to transfer directly (Kirwan & Birchall, 2006; Massenberg et al., 2016). A possible explanation is the employees' focus, within the health care system on the

prevention of negative outcomes and therefore they are more likely to apply training content if they believe it would reduce the risk of negative consequences.

Most of the literature regarding transfer of training assumed that the training content is irrelevant for the transfer of training. Transfer of training literature mainly discussed soft-skill training (intrapersonal skills and interpersonal skills) whereas hard-skills training (technical skills that require working with equipment or software) have been largely neglected (Laker & Powell, 2011). However, as Laker and Powell (2011) suggested different transfer system factors may be influencing motivation to transfer for hard-skills training versus soft-skills training. Massenberg and Kauffeld (2015) found support for this assumption and indicated that the type of training (hard-skills versus soft-skills) moderates the relation between a transfer system factors and motivation to transfer. The training assessed in this study is hard-skills training, which might have affected the number of relevant factors negatively.

Surprisingly, the positive influence from feedback on motivation to transfer was not confirmed. This finding is in contrast with some previous research e.g. (Kirwan & Birchall, 2006). However, not all studies using the LTSI questionnaires found a significant effect of feedback on motivation to transfer (Massenberg et al., 2016). This might be due to the manner in which the items are formulated. Van den Bossche et al. (2010) has shown in their study that not all aspects of feedback have a positive relationship with motivation to transfer. Instead, frequency of feedback has been found to have a negative impact on motivation to transfer, whereas the number of people providing feedback and the helpfulness of the feedback do relate positively to motivation to transfer. In fact, the items in the questionnaire focus on the frequency of feedback, rather than on the number of feedback sources and the helpfulness of the feedback. Thus, it could be concluded that the number of feedback is not significantly related to motivation to transfer, but aspects such as the number of sources and the helpfulness of the feedback may affect motivation to transfer.

## 5.2 Theoretical implications

First, this study contributes to the existing literature regarding EMR training by combining it with transfer of training literature. This resulted in motivation to transfer as a possible leverage point within the EMR training literature. Without motivation to transfer, actual transfer of training is unlikely to occur (Grohmann et al., 2014; Massenberg et al., 2016). This indicates the mediating role of motivation to transfer in the relationship between transfer system factors and transfer of training. It has been shown that trainees, who expect more negative personal outcomes from not transferring the training content to the job, are more motivated to transfer. Moreover, the effect of peer support as an important work environment factor has been shown. Additionally, believing in one's own capacity and in positive outcomes makes trainees more motivated to transfer. In conclusion, this study provides a start with creating insight in the influential factors affecting motivation to transfer, which in turn is known to affect actual transfer of training.

Although previous research has suggested many factors influencing motivation to transfer, a comparison between transfer system factors in private, nonprofit and public organizations revealed different key variables per organization type (Holton, Chen, & Naquin, 2003). For example, trainees from organizations in the public sector expect more negative personal outcomes if they do not apply the training content and experience more resistance to change within their organization.

Furthermore, Hughes et al. (2016) argued that the health care has its own unique environment, characterized by low temporal stability, high skill differentiation, rotating leadership structure, high authority differences and high interdependence. Therefore, additional research regarding the transfer of training in health care organizations is required.

Besides organizational type, training content is also likely to impact factors affecting motivation to transfer. For example, hard-skills and soft skills have been found to differ in their impact on the actual transfer of training (Laker & Powell, 2011). Most literature focused on soft-skills training whilst less is known regarding the transfer of hard-skills training. This study gained more insight into the transfer of hard-skills training.



### 5.3 Practical implications

The results of this study have practical value for EMR training within health care organizations. Specifically, motivation to transfer is highlighted as important leverage point to affect EMR training outcomes. To affect motivation to transfer, health care organizations should ensure that trainees experience enough possibilities to network with their peers about the training content. For instance, trainees could be offered time to share skills and experiences regarding useful EMR features in the EMR. Moreover, the importance of the EMR training should be emphasized and the negative consequences of inappropriate use of the EMR should be clear. Finally, the trainees should be encouraged to believe in their own capabilities with EMR use and provided a further stimulation by reward for their efforts. By improving the effectiveness of EMR training, meaningful use of EMR could be accomplished, which in turn could result in a better quality of health care.

### 5.4 Limitations and further research

Some limitations of the present study should be considered for the interpretation and generalization of its findings. First, all transfer system factors were measured using questionnaires instead of multiple sources for data collection and in this questionnaire both the dependent and the independent variables were measures in the same questionnaire. This increases the risk of common method bias. Different question blocks were used to reduce this risk. Furthermore, in the factor analysis, not one single factor was revealed, nor was there one general factor that accounted for most of the variance. This makes it less likely that common method bias explains all of the variance found in this study. A second limitation with respect to the questionnaire is that is based on self-assessment. However, the items in this study were based on the LTSL, which was developed to ‘*to measure individual perceptions of transfer system constructs*’. No one else than the individual itself can describe his or her individual perceptions. Therefore, in this study self-reports were considered an adequate method to measure the transfer system factors.

Moreover, in this study, the influence of the transfer system factors was only measured directly after the training, whereas previous research (Gegenfurtner et al., 2009; Kirwan & Birchall, 2006) suggested that motivation to transfer is a dynamic concept being affected by different factors before the training (Massenberg et al., 2016), directly after the training and three months after the training (Leitl & Zempel-Dohmen, 2006). Therefore, future research should include more moments in time to assess the full dynamics of motivation to transfer and how it affected.

The transfer system factors in this study explained around one third of the variance in motivation to transfer, which suggests that there are more factors impacting motivation to transfer. Therefore,

future research could include other variables that have been suggested to influence motivation to transfer, such as the intentions of the trainer (Baldwin, Kevin Ford, & Blume, 2017).

Finally, in this study few physicians from surgical or supporting specialties were included.

Consequently, the results of this study should be generalized cautiously since the sample of this study is not representative for all physicians in an educational hospital. Further research regarding factors affecting motivation to transfer of EMR training should include a larger sample, including physicians from non-surgical, surgical and supporting specialties from both general and educational hospitals.

## 5.5 Conclusion

Effective EMR training could contribute to the appropriate use of EMR, which in turn could increase patient safety. An effective EMR training requires transfer of the training content to the job setting. This transfer of training is mediated by motivation to transfer. The results of this study highlight peer support, negative personal outcomes and efficacy beliefs as important factors affecting motivation to transfer EMR training.

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## Appendix A - Questionnaire

Geef voor elk van de volgende items aan in hoeverre u het eens bent met het item door het bijbehorende cijfer te omcirkelen. Per uitspraak mag u slechts één cijfer omcirkelen. Hierbij geldt **1= Zeer oneens, 2= Oneens, 3= Niet oneens/niet eens, 4=Eens, 5= Zeer eens**.

Denk bij de volgende items aan de EPIC OPLEIDINGSBIJEENKOMST.

	Zeer oneens	Oneens	Niet oneens/ niet eens	Eens	Zeer eens
1. Voorafgaand aan de training, wist ik hoe de training van invloed zou zijn op mijn prestaties.	1	2	3	4	5
2. De training leidt tot hogere persoonlijke productiviteit.	1	2	3	4	5
3. Als ik deze training gebruik, heb ik meer kans om beloond te worden.	1	2	3	4	5
4. Werknemers in deze organisatie worden bestraft als ze niet toepassen wat ze geleerd hebben in de training.	1	2	3	4	5
5. De hulpmiddelen die in de training worden gebruikt (benodigdheden, afbeeldingen, etc.), lijken veel op echte dingen die ik gebruik in mijn werk.	1	2	3	4	5
6. Het is duidelijk dat degenen die de training geven, begrijpen hoe ik ga gebruiken wat ik leer.	1	2	3	4	5
7. Ik heb geen tijd om de training toe te passen.	1	2	3	4	5
8. Ik krijg de mogelijkheid om deze training uit te proberen in mijn werk.	1	2	3	4	5
9. Mijn collega's stellen het op prijs als ik mijn nieuwe vaardigheden gebruik die ik in de training geleerd heb.	1	2	3	4	5
10. Als ik geen gebruik maak van de nieuwe technieken die ik in de training geleerd, word ik berispt.	1	2	3	4	5
11. Voorafgaand aan de training, begreep ik goed hoe deze zou aansluiten bij mijn ontwikkeling in mijn werk.	1	2	3	4	5
12. De trainers gebruikten veel voorbeelden die me lieten zien hoe ik het geleerde in mijn werk kon toepassen.	1	2	3	4	5



	<b>Zeer oneens</b>	<b>Oneens</b>	<b>Niet oneens/ niet eens</b>	<b>Eens</b>	<b>Zeer eens</b>
13. De middelen die ik nodig heb om te gebruiken wat ik heb geleerd, zijn beschikbaar zijn na de training.	1	2	3	4	5
14. Na afloop van de training, stond ik te popelen om in mijn werk uit te proberen wat ik heb geleerd.	1	2	3	4	5
15. De methodes die bij de training worden gebruikt lijken erg op de aanpak die we in het werk volgen.	1	2	3	4	5
16. Mijn collega's moedigen me aan de vaardigheden te gebruiken die ik in de training geleerd heb.	1	2	3	4	5
17. Als ik mijn training niet gebruik, zal me dat een waarschuwing opleveren.	1	2	3	4	5
18. Ik denk dat de training me zal helpen om mijn huidige werk beter te doen.	1	2	3	4	5
19. Als ik probeer deze training te gebruiken, gaat dit te veel ten koste van mijn andere werkzaamheden.	1	2	3	4	5
20. Als ik gebruik maak van de dingen die ik in de training leer, helpt dat om hogere beoordelingen te krijgen.	1	2	3	4	5
21. Ik krijg mogelijkheden om deze training te gebruiken in mijn werk.	1	2	3	4	5
22. Ik vind het fijn dat training zoveel op mijn echte werk lijkt.	1	2	3	4	5
23. Ik wist wat ik van de training kon verwachten, voordat ik eraan begon.	1	2	3	4	5
24. Ik word waarschijnlijk meer gewaardeerd voor mijn werk als ik deze training gebruik.	1	2	3	4	5
25. Door de manier waarop de trainers de stof behandelden kreeg ik meer vertrouwen dat ik het zou kunnen toepassen.	1	2	3	4	5
26. Er is momenteel zoveel aan de hand op mijn werk, dat ik mijn training niet kan uitproberen.	1	2	3	4	5
27. Op mijn werk verwachten mijn collega's dat ik ook gebruik maak van wat ik leer in de training.	1	2	3	4	5

Denk bij de volgende items aan **TRAINING IN HET ALGEMEEN** in het Radboudumc.

	Ze er oneens	Oneens	Niet oneens/ niet eens	Eens	Ze er eens
28. Ik twijfel nooit aan mijn vermogen om nieuw geleerde vaardigheden in mijn baan te gebruiken.	1	2	3	4	5
29. Mijn werkprestaties verbeteren als ik de nieuwe dingen toepas die ik geleerd heb.	1	2	3	4	5
30. De mensen die hier beloond worden, zijn ook meestal degenen die het verdienen.	1	2	3	4	5
31. Mensen doen vaak suggesties over hoe ik mijn werkprestaties kan verbeteren.	1	2	3	4	5
32. Ervaren werknemers in mijn team houden anderen voor de gek als ze nieuwe technieken gebruiken die ze in een training hebben geleerd.	1	2	3	4	5
33. Ik weet zeker dat ik belemmeringen op mijn werk kan overwinnen, die me hinderen in het gebruik van mijn nieuwe vaardigheden of kennis.	1	2	3	4	5
34. Als ik dingen doe om mijn prestaties te verbeteren, heeft dat zeker positieve gevolgen voor me.	1	2	3	4	5
35. Op mijn werk heb ik veel vertrouwen dat ik dingen die ik in de training heb geleerd, toe kan passen, zelfs in moeilijke of belastende situaties.	1	2	3	4	5
36. Hoe meer ik mijn best doe om te leren, des te beter presteer ik in mijn werk.	1	2	3	4	5
37. Ik krijg veel adviezen van anderen over hoe ik mijn werk beter kan doen.	1	2	3	4	5
38. Mensen in mijn team zijn niet bereid zich in te spannen om hun manier van werken te veranderen.	1	2	3	4	5
39. Mijn baan is ideaal voor iemand die graag beloond wordt als hij/zij iets heel goed doet.	1	2	3	4	5
40. Hoe meer ik trainingen toepas in mijn werk, des te beter doe ik mijn werk.	1	2	3	4	5
41. Het team waarin ik werk probeert niet graag nieuwe manieren van werken uit.	1	2	3	4	5
42. Mensen vertellen me vaak dingen om me te helpen mijn werkprestaties te verbeteren.	1	2	3	4	5

## Appendix B - items per factor

Factor	Item Number	Item
<b>Motivation to transfer</b>	2	De training leidt tot hogere persoonlijke productiviteit.
	14	Na afloop van de training, stond ik te popelen om in mijn werk uit te proberen wat ik heb geleerd.
	18	Ik denk dat de training me zal helpen om mijn huidige werk beter te doen.
<b>Training design</b>	5	De hulpmiddelen die in de training worden gebruikt (benodigdheden, afbeeldingen, etc.), lijken veel op echte dingen die ik gebruik in mijn werk.
	6	Het is duidelijk dat degenen die de training geven, begrijpen hoe ik ga gebruiken wat ik leer.
	12	De trainers gebruikten veel voorbeelden die me lieten zien hoe ik het geleerde in mijn werk kon toepassen.
	15	De methodes die bij de training worden gebruikt lijken erg op de aanpak die we in het werk volgen.
	22	Ik vind het fijn dat training zoveel op mijn echte werk lijkt.
<b>Negative personal outcomes</b>	10	Als ik geen gebruik maak van de nieuwe technieken die ik in de training geleerd, word ik berispt.
	17	Als ik mijn training niet gebruik, zal me dat een waarschuwing opleveren.
<b>Resistance to change</b>	38	Mensen in mijn team zijn niet bereid zich in te spannen om hun manier van werken te veranderen.
	41	Het team waarin ik werk probeert niet graag nieuwe manieren van werken uit.
<b>Learner readiness</b>	1	Voorafgaand aan de training, wist ik hoe de training van invloed zou zijn op mijn prestaties.
	11	Voorafgaand aan de training, begreep ik goed hoe deze zou aansluiten bij mijn ontwikkeling in mijn werk.
	23	Ik wist wat ik van de training kon verwachten, voordat ik eraan begon.
<b>Opportunity to transfer</b>	7	Ik heb geen tijd om de training toe te passen.
	8	Ik krijg de mogelijkheid om deze training uit te proberen in mijn werk.
	19	Als ik probeer deze training te gebruiken, gaat dit te veel ten koste van mijn andere werkzaamheden.
	21	Ik krijg mogelijkheden om deze training te gebruiken in mijn werk.
	26	Er is momenteel zoveel aan de hand op mijn werk, dat ik mijn training niet kan uitproberen.
<b>Efficacy beliefs</b>	30	De mensen die hier beloofd worden, zijn ook meestal degenen die het verdienen.
	33	Ik weet zeker dat ik belemmeringen op mijn werk kan overwinnen, die me hinderen in het gebruik van mijn nieuwe vaardigheden of kennis.
	34	Als ik dingen doe om mijn prestaties te verbeteren, heeft dat zeker positieve gevolgen voor me.
	35	Op mijn werk heb ik veel vertrouwen dat ik dingen die ik in de training heb geleerd, toe kan passen, zelfs in moeilijke of belastende situaties.
<b>Feedback</b>	31	Mensen doen vaak suggesties over hoe ik mijn werkprestaties kan

		verbeteren.
	37	Ik krijg veel adviezen van anderen over hoe ik mijn werk beter kan doen.
	42	Mensen vertellen me vaak dingen om me te helpen mijn werkprestaties te verbeteren.
<b>Peer support</b>	9	Mijn collega's stellen het op prijs als ik mijn nieuwe vaardigheden gebruik die ik in de training geleerd heb.
	16	Mijn collega's moedigen me aan de vaardigheden te gebruiken die ik in de training geleerd heb.
	27	Op mijn werk verwachten mijn collega's dat ik ook gebruik maak van wat ik leer in de training.

## Appendix C - Data construction

A principal axis factor analysis was carried out on the 42 items with oblique rotation (direct oblimin). The KMO measure and Bartlett's sphericity test confirmed the sampling adequacy for the analysis (KMO .67 , Bartlett's test of sphericity  $\chi^2=1165.08$ ,  $P<.001$ ). The number of factors was based on Kaiser's criterion of eigenvalues greater than 1 and the inflexion on the scree plot. After the initial analysis, the output was checked for communalities greater than |.20|. This resulted in a nine factor structure.

### Factor loadings

	Factor								
	1. Training design	2. Negative personal outcome	3. Resistance to change	4. Learner readiness	5. Opportunity to perform	6. Efficacy beliefs	7. Motivation to transfer	8. Feedback	9. Peer support
Item 12	<b>.650</b>	.018	-.143	-.118	-.066	-.055	.004	-.101	-.056
Item 6	<b>.620</b>	-.103	-.028	-.104	-.092	-.014	-.115	.031	-.044
Item 22	<b>.583</b>	-.026	-.050	.023	.064	.051	-.164	-.026	-.300
Item 5	<b>.582</b>	-.096	-.042	-.039	-.056	.060	-.131	.129	.168
Item 15	<b>.496</b>	.068	.210	.021	-.124	.095	.110	.032	.014
Item 17	-.012	<b>.936</b>	-.003	.055	.010	.068	.173	.044	-.093
Item 10	-.037	<b>.676</b>	.090	-.014	.173	-.084	-.107	.056	-.072
Item 41	-.229	-.029	<b>.640</b>	-.120	-.030	.030	-.056	-.160	-.085
Item 38	.173	.143	<b>.544</b>	.004	.038	-.130	-.065	-.132	.194
Item 23	-.009	-.022	.175	<b>-.892</b>	.033	.028	-.064	.070	.022
Item 1	-.004	.071	-.011	<b>-.823</b>	.034	-.078	.013	.015	.014
Item 11	.126	-.124	-.096	<b>-.729</b>	.039	.076	.029	-.005	-.182
Item 19	.014	.072	.154	.056	<b>.763</b>	.030	.205	.099	-.148
Item 7	.022	.007	.073	-.097	<b>.711</b>	-.027	.107	-.049	.146
Item 26	-.121	.146	-.033	-.153	<b>.641</b>	-.179	-.089	.029	.059
Item 8	.098	-.124	.222	.054	<b>-.575</b>	-.064	.104	.167	-.029
Item 21	.189	.113	.079	-.188	<b>-.431</b>	.100	-.045	-.036	.065
Item 34	.141	-.081	.206	.059	.107	<b>.710</b>	-.201	.055	-.041
Item 35	.007	.062	-.103	.013	-.162	<b>.660</b>	.019	.014	-.036
Item 33	-.013	-.125	.004	-.146	-.092	<b>.396</b>	.203	.014	.036
Item 30	-.050	.058	-.285	-.040	.017	<b>.376</b>	-.119	-.048	.088
Item 18	-.113	.044	.062	-.025	-.171	-.042	<b>-.723</b>	.044	-.091
Item 2	.120	-.121	-.046	-.024	.003	.046	<b>-.589</b>	.048	-.005

Item 14	.214	.003	.101	-.039	.003	.150	<b>-.561</b>	-.055	-.073
Item 42	-.083	-.065	.077	-.051	.007	.079	.001	<b>.909</b>	-.015
Item 37	.077	.185	-.243	-.036	-.070	-.164	-.106	<b>.675</b>	.151
Item 31	.056	.109	-.169	-.012	.032	.056	.019	<b>.485</b>	-.237
Item 9	.064	.030	-.032	-.064	-.038	-.065	-.060	-.087	<b>-.632</b>
Item 16	.031	.093	.058	-.028	.017	.048	-.091	.195	<b>-.593</b>
Item 27	-.047	.325	-.015	-.139	-.037	.021	-.025	.080	<b>-.473</b>