Summary
Chapter 1 presents an overview of the background of patient safety research and patient safety education on a national and an international scale. The research questions and methodology of this thesis are also outlined in this chapter.

Since the extent of harm due to adverse events became visible and the gravity of the problem was recognized, the need to improve patient safety has been expressed throughout the world. Education of health care workers in patient safety is believed to be an important step towards the improvement of patient safety. Patient safety education focuses on the acquisition of knowledge, attitudes and skills to support changes in behavior to deliver safer care. A major part of the patient safety principles involve non-technical skills and therefore are not necessarily discipline-specific. Important patient safety educational topics are, for example, learning from errors by reporting of incidents, human factors engineering, and information transfer between health care workers and towards patients.

Medical residents are key figures in delivering care and an important target group for patient safety education. In the context of this thesis, ‘residents’ or ‘registrars’ refers to medical graduates: doctors who finished medical school and who may or may not be in training to become a medical specialist. We hypothesized that educating residents in patient safety issues would influence their behavior as well as the antecedents of their behavior concerning patient safety improvement. The Theory of Planned Behavior (TPB), a social psychological model that can be used to explain behavioral change, was used as a theoretic framework for our research.

For this thesis, we conducted six studies that primarily focused on the development and the effects of patient safety education for residents. Moreover, the studies provided insight into factors influencing residents’ behavior to improve patient safety.

Chapter 2 presents a systematic review of the literature to give insight into the characteristics and the effects of patient safety education for residents. By searching PubMed, Cochrane Library, EMBASE, CINAHL, PsycINFO and ERIC until February 2010, 17 relevant articles that contained original data were identified. More than one third of these studies were published in the past two years and all studies were conducted in the USA. Interventions mostly consisted of multiple sessions with interactive and experiential educational methods (i.e. discussions, feedback, role-play, or simulations). Attended topics most often found were learning from mistakes: error reporting and analysis and systems thinking and cultural change. Evaluations mostly focused on attendants’ participation or modification of knowledge, skills or behavior. All articles described positive effects following the education, and almost half mentioned equivocal results as well. However, strength of findings was limited in all studies. More than three-quarter of the included studies contained non-comparative data and more than half used a pre-post design. Two studies were randomized trials. All but one of the studies used subjective outcome measures (e.g. self-assessment of knowledge gained and attitudes concerning education), whereas only just over half the studies included objective outcome measures (e.g. conference attendance, chart audits and OSCE’s). None of the identified studies used validated evaluation tools.

We concluded that various experiences at educating residents in patient safety have been described and that these can offer inspiration for the development of patient safety.
education elsewhere. Studies mainly described positive effects in the short-term, but the effectiveness of the education was difficult to judge from the literature.

Chapter 3 describes the development and content of a patient safety course for residents. Residents’ and supervisors’ perspectives on current patient safety performance and on the educational needs of residents were investigated by means of a questionnaire, which was filled out by 116 (64%) respondents. Residents rated health care as significantly safer than supervisors. This might indicate that residents are not fully aware of potential risks of their work and of their own role in patient safety, which underlines the need for an explicit focus on patient safety issues during their training. Close links were found between mentioned patient safety risks and expressed patient safety educational needs. Residents and supervisors had mentioned educational needs that were predominantly related to team factors; work environmental factors; and individual factors. Based on the questionnaires’ outcomes, a selection of course content and corresponding educational methods was made by an expert panel. The following principal course themes were selected: 1) principles of patient safety; 2) human factors; 3) effective teamwork; 4) contribution to safer care; and 5) medico-legal aspects of patient safety. Workshops, practice assignments, mentoring and assessments were among the chosen educational methods. This study demonstrated that a needs assessment among involved parties engages respondents in the process and can provide valuable input for developing patient safety education for residents.

Chapter 4 gives insight into the effects of a 2-day patient safety course for residents on their incident reporting attitudes, intentions and behavior. The course aimed at increasing residents’ knowledge, attitudes and skills to recognize and cope with unintended events and unsafe situations at an early stage. Data were collected by means of questionnaires before, immediately after and six months after the course was given. At all three points in time, the response rate was 100% (n=33). Significant changes in incident reporting attitudes and intentions were found immediately after the course as well as during follow-up. However, no significant changes were found in residents’ incident reporting behavior. This showed that patient safety education can have longer-term positive effects on attitudes and intentions towards reporting incidents of residents, but that further efforts are required to induce a real change in behavior.

Chapter 5 continues the exploration of the effects of a patient safety course for residents. This course consisted of two days with plenary sessions and small group sessions to stimulate interactive learning. To stimulate experiential learning, the residents were given practice assignments for a period of four to six weeks between the course meetings. To evaluate the course, residents’ knowledge, skills, attitudes, intentions and behavior concerning incident reporting were measured. The study had a controlled design with follow-up measurements and three data collection methods: 1) questionnaires filled out before, immediately after and three months after the course; 2) incident reporting cards filled out by course participants during the course; and 3) residents’ reporting data gathered from hospital incident reporting systems.
Forty-four residents participated in the intervention group and attended the patient safety course. Thirty-two residents from another hospital participated in the control group. Positive changes in knowledge, skills and attitudes were found after the course. Participants filled out 165 incident reporting cards, which demonstrated residents’ skills to notice incidents. Residents’ intentions to report incidents were positive at all measurements. Residents who had reported incidents before, reported more incidents after the course. However, the number of reporting residents did not increase. The increase in reported incidents was also registered by the reporting system of the intervention hospital.

We concluded that patient safety education can have immediate and longer-term positive effects on knowledge, skills and attitudes, and modestly influences the reporting behavior of residents.

**Chapter 6** investigates the longer-term effects of patient safety education for residents by focusing on participants’ intentions and actions concerning patient safety improvement. Four multi-specialty 2-day patient safety courses were organized, in which 71 residents from five hospitals participated. Two courses were organized at an academic center and two at a general teaching hospital. At the end of these courses participants were asked to formulate an action point to improve patient safety. Three months later, semi-structured interviews were conducted with these residents to identify actions that were taken, factors that had influenced their behavior and reactions concerning the education. An inductive theory approach was used to analyze the answers. Action points and influencing factors were classified into three levels of health care: 1) the *individual professional*, which refers to the resident; 2) the *social context*, which represents residents’ colleagues or department; and 3) *organizational context*, which corresponds to the organization residents work for.

In total, 69 (97%) residents, who had formulated 91 action points in total, were interviewed. Action points mainly focused on the individual professional or the social context of residents. Action points most often mentioned were: *improving organization of own work / follow policies* and *improving culture / educate colleagues about patient safety*. Sixty-two (90%) residents declared to have taken action, although just 50 (55%) action points were fully carried out. Actions taken were mostly at the level of the individual professional, and less frequently at the level of their social or organizational context. Results of actions included: *adjustment of own structure of work*; *having organized patient safety education for colleagues*; *more efficient and structured communication towards colleagues*; and *reporting of incidents*. Promoters for action included: *awareness of the importance of the action to be taken*; *supportive attitude of colleagues*; and *having received patient safety education*. Barriers included: *attitudes of colleagues*; *high work-pressure*; *hierarchy*; and *switching of work stations*. Most residents were very enthusiastic about the course, they mentioned it was enjoyable and interesting, and they acknowledged the importance of educating residents on these principles. Most residents also were satisfied with the structure and educational methods of the course. Some residents proposed suggestions for improvement of the education, for example to offer this course to residents who are in the beginning of their residency, to offer the course to other
health care workers as well, and to organize fresh-up moments once in a while to help keeping up the attention for this important subject matter.

We concluded that residents had various intentions to contribute to patient safety improvement. However, even though numerous actions were taken, a gap remained between intentions and actual behavior. To increase residents’ participation in patient safety improvement, attention must be paid to removing experienced barriers, most of which are related to residents’ social and organizational context.

Chapter 7 of this thesis provides insight into the barriers that keep residents from reporting incidents, and it outlines the possible solutions that were offered by residents themselves. For this study, we organized three focus group sessions with residents. In each of these groups, six to eight residents participated, resulting in a total number of 22 participants. An inductive approach was used to analyze the transcribed discussions.

Residents indicated that they did not report all of the incidents they were aware of, because they experienced a negative attitude towards incident reporting, because they experienced a non-stimulating culture, and because of a lack of (perceived) ability to report. Solutions to remove these barriers included: providing possibilities to report incidents anonymously; providing feedback; creating an incident reporting culture; simplifying the incident reporting procedure; clarifying what to report and how to report incidents; and stimulating residents to report incidents.

Chapter 8 summarizes and discusses the main findings and methodological considerations of the studies in this thesis. Moreover, recommendations are given for the organization of patient safety education for residents and for increasing residents’ participation in patient safety improvements. Finally, suggestions for future research are proposed.

The studies in this thesis did find some promising effects of 2-day patient safety courses for residents. The evaluations demonstrated that these courses can have immediate and longer-term positive effects on knowledge, skills and attitudes, but they only modestly influence the reporting behavior of residents. Barriers that residents experienced in taking action to improve patient safety were mostly on the level of residents’ social or organizational context; in other words, they are related to their colleagues, their department or the organization the resident is working for. Thus, to increase residents’ participation in patient safety improvement, it is important that, apart from graduate medical educational efforts, attention is also being paid to solving the experienced barriers. Residents’ practical suggestions to solve some of these barriers were incorporated into the implications for practice and in the directions for future research.

Implications related to the design of the patient safety education
- Involve people in developing patient safety education
  Uniting a lot of expertise (e.g. of didactical experts, patient safety experts, hospital managers, residents and supervisors) can be of benefit for the development of patient safety education. Simultaneously, engagement in the development process stimulates thinking about the subject and may contribute to a feeling of commitment to the education in progress.
- Train multiple residents per department
Training multiple residents per department in the same patient safety principles makes it easier for them to collaborate when taking actions to improve patient safety on the department. Attending the patient safety course together stimulates discussions about this topic, which could result in a feeling of alliance, and the trained residents can support each other in patient safety improvement actions once they are back in daily practice.

- **Offer patient safety courses at the beginning of residency**
  At the beginning of their residency, residents are still searching for the right routines and are more flexible to incorporate new strategies into their daily practice. Moreover, beginning residents often have little work-experience, which is considered a risk-factor that could endanger patient safety.

- **Stimulate creating action plans & keep paying attention**
  Creating action plans stimulates thinking about and discussing barriers which could play a role in patient safety improvement and how to overcome these in advance. It is important that attention is being paid to these actions plans continuously to prevent the intentions from silting up.

- **Make use of residents’ experiences**
  Residents have a lot of reality-based casuistic in which patient safety was at risk, and they are often willing to discuss these in a group with other residents. Making use of these casuistic enables residents to easily link the course material to their own daily practice. The use of own casuistic could be especially valuable for exercising incident analysis and formulating strategies for prevention.

- **Integrate patient safety into other educational moments**
  Integration of patient safety topics into other educational situations could create fresh-up moments, which stimulates maintenance of previous lessons. Moreover, if patient safety is incorporated into educational moments in practice, this could help linking patient safety principles to the daily practice of residents.

**Implications related to adjustments in residents’ social and organizational context**

- **Focus on and inform about patient safety**
  An explicit focus on patient safety is needed in hospital management as well as in residents’ education. Residents should be informed about the efforts that have been made, about the results of these efforts and about what is yet to come. This is especially relevant for hospital managers and for people involved in the development and delivery of graduate medical education.

- **Train the context of residents as well**
  Training the colleagues of residents (e.g. nurses and supervisors) is important to stimulate an open culture. Residents’ supervisors in particular are an important group that could strongly influence residents’ behavior, as they are the residents’ teachers and evaluators and therefore they have a strong influence on residents’ perception of the prevailing social normative pressures.

- **Encourage patient safety initiatives**
  Preferred patient safety behavior should be encouraged and praised to achieve and retain this behavior.

- **Simplify systems and procedures**
Systems and procedures should be easily accessible and easy to use. It is recommended to discuss this with the users to identify possible bottlenecks in existing systems and procedures.

- Actively involve residents in patient safety improvements
  Residents are often willing to identify and think about a constructive solution to problems concerning patient safety. Residents’ unique position in health care (e.g. frequent switching of work stations) makes them especially suitable for giving feedback and tips for system improvements.

- Restrict residents’ work-pressure
  Adjusting behavior might take some extra time, both for exercising new behavior and for integrating this behavior into existing routines. A lack of time could hinder the implementation of patient safety improvement behavior. This is especially of concern at the general teaching hospitals.

Implications for future research
The studies described in this thesis can be considered as just a beginning of research concerning patient safety education for residents in the Netherlands. There is much more to explore in this field. Upcoming research should focus on further investigation of the effects of patient safety education and explore possibilities and results of taking away identified barriers. For future research it is recommended to use multiple outcome measures and to include objective outcome measures if possible (e.g. independent observations in practice; investigations of patient records; or data of the hospitals’ reporting systems). Research designs should preferably include control groups, randomization to groups, long-term follow-up measurements and validated measurement tools.

More research is required to acquire more insight into the following questions:
- Are there other effects of our patient safety course, which may not have been traced by the tools that were used?
- What is the relation between specific curricular content and the effects of teaching this content?
- What is the most effective method to increase patient safety improvement behavior of residents?
- What are the effects of training residents together with other health care workers (i.e. nurses and supervisors)?
- What are the effects of mono-specialty training programs for residents?
- What is the relative importance of the identified barriers that inhibit residents’ patient safety improvement behavior?
- What are the possibilities to overcome the most urgent barriers?
- What are the effects of interventions to overcome the identified barriers?
- How can the measurement tools be validated?

Conclusion
The studies in this thesis demonstrated that a 2-day patient safety course for medical residents helped to increase residents’ patient safety awareness, to positively influence residents’ attitudes and intentions, and to stimulate the development of specific patient safety skills, such as noticing and analyzing incidents. How this change in awareness,
intentions and skills could be transposed into a long-lasting change in patient safety improvement behavior is an important topic for further research. However, it may be safely assumed that this goal can only be reached if patient safety is integrated as a permanent element of formal and non-formal education.