Summary
The growing number of older people within most western countries leads to this subpopulation receiving increasing attention from politicians, policy makers and researchers. Studies regarding patient safety have shown that older hospitalised patients are at greater risk for adverse events, such as delirium. These increased risks mean that hospitals have to take action to prevent an aging population from resulting in an increase in adverse events in hospitals, and an increase in the healthcare consequences and costs associated with these events. In the Netherlands, efforts have been made to improve care for older hospitalised patients in the Frail Elderly Project (FEP), one of the projects of the national Patient Safety Programme. As part of FEP, hospitals worked on improving care for older patients regarding falls, malnutrition, functional decline, and delirium.

This thesis focuses on patient safety and quality of care for older hospitalised patients at-risk for delirium, and specifically on the effects of e-learning on the implementation of FEP.

The general research question of this thesis was:

How can safety and quality of care for older hospitalised patients at risk of delirium be improved?

This general question was divided into 5 specific research questions:

1. Which barriers exist to adherence to the FEP delirium guideline by nurses?

In a qualitative study we aimed to identify and classify barriers to guideline adherence by nurses by exploring the perceptions of nurses and other professionals regarding the implementation of the FEP guideline on delirium care. We conducted open-ended interviews between June and September 2011 with 28 nurses, 18 physicians and 17 policy advisors working in 19 hospitals in the Netherlands. Barriers to guideline adherence that were identified in this study could be grouped into four themes: motivation and goals, knowledge and skills, professional role and identity, and context and resources. While the interviews with nurses, physicians and policy advisors produced similar views of the current situation, physicians and policy advisors placed a higher importance on education as a means of stimulating adherence. This study illustrates that individual, social and organisational factors play a role in nurses’ adherence to a delirium guideline. The potential benefits of
following a guideline, both for patients and for nursing staff, need to be highlighted in order to motivate nurses. When formulating new guidelines, nurses’ perceptions of their professional role and patient care need to be taken into account, to ensure that policy makers and managers are realistic about guideline adherence and engage with nurses from a position of mutual respect and trust.

2. Does the use of e-learning improve nurses’ delirium knowledge?
While the first research question aimed to identify barriers to adherence to the FEP guideline, questions two and three looked at a possible means of neutralising some of these barriers: adding an educational intervention to FEP. Our aim was to assess the effect of an e-learning course, based on nationally recommended guidelines for delirium care including the FEP guideline, on nurses’ delirium knowledge. In addition, we looked at the association between participant demographics and baseline delirium knowledge, as well as between demographics and the effect of the course on delirium knowledge.
We conducted a before-and-after study, with an e-learning course on delirium as intervention. The course was introduced to all nursing staff (n = 1,196) of internal medicine and surgical wards of 17 Dutch hospitals. Test scores on the final knowledge test (mean 87.4, 95% CI 86.7 to 88.2) were significantly higher than those on baseline (mean 79.3, 95% CI 78.5 to 80.1). The e-learning course significantly improved nurses’ knowledge of delirium in all subgroups of participants and for all question categories. At baseline, nursing staff had the most difficulty with questions related to the definition of delirium: what are its symptoms, course, consequences and which patients are at risk. The mean score for this category was 74.3 (95% CI 73.1 to 75.5). Contrary to other studies, the baseline knowledge assessment showed that, overall, nursing staff were relatively knowledgeable regarding delirium.

3. Does the use of e-learning improve the provision of delirium care by nurses according to the FEP delirium guideline?
After looking at the effects of e-learning on knowledge, we focused on the effects of e-learning on the implementation of the delirium part of FEP. The objective was to determine whether e-learning can be an effective means of improving adherence to the FEP delirium guideline by nurses, specifically
focusing on preventive screening of older patients for risks, observing at-risk patients for delirium, and taking preventive or curative measures. In a stepped wedge cluster randomised trial, an e-learning course on delirium was introduced aimed at nursing staff. The trial was conducted on general medical and surgical wards in 18 Dutch hospitals. The e-learning course on delirium had a significant positive effect on the risk screening of older patients by nursing staff (OR 1.8, p value <0.01), as well as on other aspects of delirium care. The number of patients diagnosed with delirium was reduced from 11.2% in the control phase to 8.7% in the intervention phase (p=0.04). Nurses who undertook a delirium e-learning course showed a greater adherence to the FEP delirium guideline. This improved the recognition of patients at risk and demonstrated that e-learning can be a valuable instrument for hospitals when implementing improvements in delirium care.

4. What can delirium rates based on patient records tell us about the occurrence of delirium in the Netherlands?

After using patient records to answer the two previous research questions, this question looked more in detail at the usefulness of patient records as a source of information on delirium occurrence. Patient records are an essential part of the care process, facilitating communication of information on patients and patients’ care between professionals and between hospital wards. Increasingly, patient records are also being used as a source of data, to assess quality of care or to conduct research. Both uses of patient records – as part of the care process and as data source – rely on the accuracy of the documentation within these records. To examine whether patient records can provide useful information on delirium occurrence rates, this study aimed to determine delirium rates among hospitalised surgical and non-surgical inpatients in Dutch hospitals, as documented in patient records. In addition, we looked at the extent to which recorded delirium rates vary between hospitals and hospital wards, after correcting for patient and admission characteristics.

Data was collected during the course of a national study on adverse events among hospitalised patients in the Netherlands, consisting of retrospective patient record reviews using 4,048 patient records from 2011/2012, from patients aged 12 months and over.

After adjusting for patient, admission and hospital characteristics, we found a corrected delirium occurrence rate of 3.5% in surgical patients and 5.5% in
non-surgical patients, and for patients aged 70 and over, a delirium occurrence rate of 6.3% in surgical patients and 5.5% in non-surgical patients. Recorded delirium rates did not vary between hospitals (ICC 0.0) and varied little between wards (ICC 5.3 surgical, 9.3 non-surgical).

The delirium occurrence rates found in this study were significantly lower than expected based on the literature. This study made clear that using only delirium as recorded in patient records can provide information on delirium rates, but there are doubts about the reliability of this information given the fact that other studies have found that delirium diagnosis was poorly documented in patient records.

5. Can preventable adverse events in older patients be predicted using a predictive model?

After focussing specifically on delirium, this thesis concluded by looking at the prediction of adverse events in general, as a possible alternative approach to improving patient safety and quality of care for older hospitalised patients. In this final study we aimed to develop and validate a predictive model for preventable adverse events in older hospitalised patients. Such a model would use clinically important risk factors that are readily available on admission. Our intention was to design a model that could be used by healthcare providers in hospitals, so they could identify older high-risk patients for preventive measures or closer clinical attention.

In order to develop a predictive model for preventable adverse events, we used data from two retrospective patient record review studies on adverse events – from 2004 and 2008 – using patient records from patients aged 70 and over. Risk factors included in the analysis were patient characteristics as well as admission and organisational characteristics.

We found that in 2004, predictors of preventable adverse events in patients aged 70 years or over were: increased age (OR 1.04 CI 1.01 - 1.06); elective admission (OR 1.65 CI 1.14 – 2.40); and admission to a surgical department (OR 1.53 CI 1.08 – 2.16). The area under the receiver operating characteristic curve for the 2004 sample was 0.60, and for 2008 this was 0.59. This indicates that the model fitted the data poorly and the model had low discriminatory power.

This study showed that several expected risk factors for preventable adverse events in older patients, including comorbidity, were unable to predict these events. It was not possible, using in-patient data available on admission and collected during the course of two patient record review studies, to develop
a satisfactory predictive model for preventable adverse events in older patients.

**Recommendations for practice and policy**
Based on the research presented in this thesis, several recommendations can be made for practice and policy.

1. **Invest in knowledge**
   As we have shown, educating professionals on specific risks or healthcare problems can help improve provided care. Education can give them the knowledge they need to be able to perform new behaviour, but can also help convince professionals of the benefits of changing their behaviour and create a sense of urgency.

2. **Make sure the organisational context is ready**
   Knowledge alone is probably not enough to ensure that a change in practice takes place. The organisation needs to be ready for professionals to demonstrate the new behaviour and, where possible, needs to support and encourage professionals to change their practice. This can mean ensuring management is supportive of the changes taking place, but also creating practical tools and materials to support the behaviour change.

3. **Take into account the attitude of healthcare professionals**
   While knowledge and organisational context are important, if the attitude of healthcare professionals is not conducive to the success of the quality improvement project, its success might still be limited. Healthcare organisations should explore the attitudes of their staff towards the topic or patient population at which the project is aimed, and take these attitudes into account when formulating project goals and guidelines. It might also be worthwhile to try to influence these attitudes – if necessary – as part of any educational efforts taking place.

4. **Invest in the quality of documentation in patient records**
   Using information from electronic patient records would offer healthcare organisations a means of monitoring their quality of care, making the effects of quality improvement efforts visible for the professionals involved. However, such use of electronic patient records requires that the data collected from the records are reliable. Organisations should therefore pay attention to the quality of
documentation in electronic patient records, to ensure that results can be measured and disseminated properly.

5. Create national attention
   National attention can help local project leaders to gain support from management and convince management and colleagues of the importance of the project. Added pressure on organisations to implement the improvement project or policy, for instance through the attention of the Healthcare Inspectorate, can add to a sense of urgency within management levels of healthcare organisations.