General introduction and outline of the thesis
Emergency Departments (EDs) all over the world are increasingly often confronted with overcrowding. As a result, patients experience longer waiting times with certain risk of being treated too late. This leads to unnecessary complications and has in some instances even led to preventable death. Furthermore, the discomfort patients experience while having to wait for a long time before being helped leads to dissatisfaction. On the side of the care-providers, overcrowding also leads to several problems. First of all, the workload for physicians and nurses working in the ED has gone up, resulting in an overworked staff suffering from reduced work satisfaction which ultimately leads to increased absence through illness. Derlet and Richards have investigated the consequences of ED crowding and have put forward the following disturbing list of effects: a public safety risk (e.g. poor patient outcomes), prolonged pain and suffering, dissatisfied patients, ambulance diversions, decreased physician productivity, violence, negative effect on teaching missions in academic medical centers, and miscommunication. In the Netherlands, another problem is contributing to progressive ED crowding and is expected to lead to considerable problems soon: general practitioner shortage. Due to a growing shortage in general practitioners (GPs) and subsequently a decreased availability of GP services, patients increasingly often bypass the general practitioners’ office and come to the ED straight away with mostly minor injuries/conditions. The first line, as the GP’s office is referred to, is an important organ in differentiating patients needing hospital care and patients that can be treated by the GP him/herself. Bypassing the GP’s office leads to an increased number of patients with largely minor injuries being presented in the ED. When the ED is crowded, these patients have to wait for a long time before being assessed, since a low urgency label is assigned to them and patients with more severe/urgent conditions are treated first. This then leads to patient dissatisfaction and irritation. In short, ED crowding is a big problem for which solutions need to be sought.
The first reports on ED crowding leading to serious problems date back to the 1970s. In the 1990s, the problems surrounding ED crowding had increased to such a degree, that they were at the top of Health Care agendas in the United States and the United Kingdom. Several solutions were then proposed and developed to address the growing problems. One of the developments following the discussion of addressing severe medical conditions too late, were the triage systems. Triage is based on short assessment of a patient on entry in the ED, to establish the urgency level of the injury/condition the patient is presented with. Accordingly, patients are assigned a classification colour known to the care providers indicating a maximum time interval that the patient could wait for definitive assessment and treatment. In this time, more severe injuries, if present in the ED, can be addressed without the mentioned patient being at risk for being treated too late. On the other hand, solutions to the problem of crowding were sought in decreasing the workload of ED physicians by deploying non-physicians to perform diagnostic tasks. The best known examples of this development are the Physician Assistants (PAs) and Advanced Nurse Practitioners (ANPs). In short, these so-called midlevel practitioners are mostly (ED)-nurses that follow a 2/2.5 year training program in which basic medicine is taught. After and during this course, the practitioners are trained to assess and treat certain injuries/conditions according to the way their supervising medical specialist teaches them to. An in-depth analysis of this movement and the (dis)advantages of this development is given in Chapter 2. When assessing the introduction of midlevel practitioners in the Netherlands, we felt that deploying non-physicians to take over certain tasks from doctors could propose major benefits for the ED. However, we felt that the way in which it is currently done (ANPs/PAs) might not be the ideal form to serve the needs of (Dutch) EDs/hospitals. Therefore, we developed a new concept that preserves the advantages of ANPs/PAs and in our opinion takes care of the disadvantages: Specialized Emergency Nurses (SENs).
Outline of the thesis

This thesis deals with the concept of deploying regular emergency nurses to assess and treat ‘minor’ injuries according to a protocol after a short and injury specific course. The diagnostic assessment protocol is of the utmost importance and should contain a clear flow diagram that is to be followed to come to the diagnosis on which treatment is given. Ankle and foot injuries were chosen to first test the SEN-concept on, since validated clinical decision rules for these injuries exist in the form of the Ottawa Ankle and Foot Rules (OAR/OFR). These rules were implemented in a treatment protocol that is further outlined in chapter 6. We set out to investigate all aspects of the proposed new concept: the diagnostic accuracy and reproducibility of both the clinical and radiological assessment were investigated in separate studies as well as combined in a clinical randomized controlled trial that also investigated the patient satisfaction associated with the new approach. Furthermore, waiting time reduction and cost-effectiveness of the SEN-concept were subject of research.

In Chapter 2, First experiences with Advanced Nurse Practitioners and Physician Assistants on Dutch Emergency Departments; (dis)advantages to the development, an overview is given concerning the introduction of ‘mid-level practitioners’ on Dutch EDs compared to the developments as are seen in other European countries and in the United States. Advantages and disadvantages to the development as seen by the authors are described and a possible alternative is proposed: the SEN-concept.

In Chapter 3, Diagnostic Accuracy of Lower Extremity X-ray Interpretation by ‘Specialized’ Emergency Nurses, the ability of SENs to accurately interpret ankle and foot radiographs is compared to the standard care as provided by junior Emergency Doctors. This was done before and after the SEN course to also be able to assess learning curves and interobserver values (reproducibility).

In Chapter 4, Letter to the editor: Can Nurses Appropriately Interpret the Ottawa Ankle Rule? A response is given on the article written by Frederick Fieseler
et al. that appeared in the May 2004 edition of the *American Journal of Emergency Medicine*. The manuscript dealt with the accuracy and reproducibility of Emergency Nurses clinically assessing ankle/foot injuries. Good accuracy values are displayed in the article although moderate interobserver values. On the count of the latter, the authors question the ability of nurses to appropriately interpret ankle/foot trauma. Our response concerns the inappropriate explanation/interpretation by the authors of kappa values (interobserver variability outcome parameter) and the conclusion that should have been drawn from the presented results in our opinion.

In Chapter 5, *Diagnostic accuracy and reproducibility in the interpretation of the Ottawa Ankle and Foot Rules by ‘Specialized’ Emergency Nurses (SENs)*, the results are presented of a prospective interobserver trial performed on the ED of the VU Medical Center from April to June 2004. Diagnostic accuracy results of the clinical interpretation of ankle/foot injuries are compared between SENs and junior Emergency Doctors. Also, interobserver variability results are given and interpreted.

In Chapter 6, *Specialized Emergency Nurses (SENs) treating ankle- and foot injuries; a randomized controlled trial*, the results of a randomized controlled clinical trial are presented and interpreted. In this chapter, the combined clinical and radiological diagnostic accuracy of SENs is compared to that of the control group (junior ED doctors). Also, the results of an accompanying patient satisfaction questionnaire are presented and compared between observer groups.

In Chapter 7, *Cost-effectiveness of the SEN-concept: Specialized Emergency Nurses (SEN) treating ankle and foot injuries, costs and cost-effectiveness of deploying regular ED nurses (SENs) to assess and treat ankle/foot injuries are compared between SENs and junior ED doctors*. This study was conducted alongside the clinical trial as described in Chapter 6.
In Chapter 8, Summary, conclusions and future prospects, the most important conclusions drawn from the investigations listed above are summarized and interpreted. Furthermore, this chapter deals with the future possibilities of the SEN-concept and hypothesizes on subsequent research projects that could further enhance the practice of Emergency Medicine.

The aims of the thesis, The SEN concept: a novel strategy for resolving Emergency Department crowding, are:

1. To compare the role and development of ANPs and PAs in EDs in the Netherlands and putting it in a European perspective,
2. To evaluate advantages and disadvantages of ANPs/PAs and putting forward a possible solution (the SEN-concept),
3. To determine the accuracy of SENs compared to junior ED doctors in interpreting lower extremity radiographs,
4. To compare the diagnostic accuracy and reproducibility of SENs and junior ED doctors in their clinical assessment of ankle/foot trauma,
5. To assess the diagnostic accuracy and patient satisfaction associated with SENs treating ankle/foot injuries completely and autonomously, and,
6. To evaluate costs and cost-effectiveness of the SEN-concept.
References


