



Acute primary care in the Netherlands

The collaboration
between general practitioner cooperatives
and emergency departments

MARTIJN RUTTEN

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For reasons of consistency within this thesis, some terms have been standardised throughout the texts. As a consequence the text may differ in this respect from the articles that have been published.

The studies presented in this thesis have been performed at the Scientific Center for Quality of Healthcare (IQ healthcare). This center is part of the Radboud Institute for Health Sciences (RIHS), one of the approved research institutes of the Radboud University Medical Center.

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and emergency departments*

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1

General introduction and outline of the thesis



Background

The seventeen million inhabitants of the Netherlands have three major routes to access medical care in case of emergencies. They could contact the General Practitioner (GP), call the emergency number (112), or visit the emergency department (ED) as a self-referral. (1, 2) These three access routes will be further outlined, focusing mainly on primary care and emergency departments and the possibilities for further cooperation.

Emergency care providers in the Netherlands

Primary care

All Dutch inhabitants are registered at a general practitioner (GP), who works in the general practice during office hours and at the General Practitioner Cooperative (GPC) in out-of-hours. The GP acts as a gatekeeper to secondary care and is able to handle more than 93% of the medical problems presented. If further specialized care is deemed appropriate, the patient will be referred.(2)

General practitioner practice

There are over five thousand GP-practices in the Netherlands, which mostly can be reached within fifteen minutes.(2, 3) The GP-practice has 4399 contacts per 1000 registered patients a year for various health related problems, of which 170 contacts per 1000 registered patients a year for complaints with an urgent character.(3, 4) The practice can be reached by calling a local telephone number which will be answered by the GP-assistant. In case of emergencies there is a special emergency line of the practice, which has to be answered within thirty seconds. The assistant performs triage to determine the urgency and consults the GP, who decides to visit the patient at home, to plan a practice consultation or to give an advice. A small minority of patients visits the practice without previous telephonic consultation.

General practitioner cooperatives

During out-of-hours, primary care is accessible through one of the 120 General Practitioner Cooperatives (GPCs), which are meant for urgent health care problems only.(1, 5) The GPC has 246 contacts per 1000 inhabitants a year, of which 58% has an urgent character (143 contacts per 1000 inhabitants a year).(5) The GPCs are accessible by telephone; under GP supervision nurses perform telephone triage determining urgency and whether the patients receive a telephone advice (39%), a centre consultation (52%), or a home visit (9%).(5) A small minority of patients consult the GPC without calling in advance.

Emergency number

The emergency number (112) can be called directly and at all times for all urgent situations, including medical urgencies.(2) Specialized nurses perform telephone triage in order to assess the urgency and required care. Mostly an ambulance staffed with a trained driver and specialized ambulance nurse will be sent to the patient for further assistance (57 urgent responses per 1000 inhabitants a year).(6) After assessment of the patient, the majority will be presented at the ED (63%), the remainder will be advised, treated on the spot or redirected to primary care settings. A considerable part of the care provided by urgent ambulance responses (43%) could, theoretically, be delivered by primary care. (7)

Emergency departments

Most Dutch hospitals have an ED for urgent consultations, which is staffed with specialized nurses and (specialized emergency) doctors. Yearly, 115 per 1000 inhabitants visit one of the 87 EDs nationwide.(8) Fifty percent of these patients are referred by primary care, sixteen percent presented at the ED via the ambulance services, seventeen percent was self-referred and fifteen percent came through different routes.(8) Self-referrals are patients who seek medical care at the ED without first consulting primary care. Of the patients attending the ED 37% is subsequently admitted at the hospital ward.(8)

Developments in emergency care in the Netherlands

Emergency care in the Netherlands seems to be under pressure and is currently subject of much debate. General practitioners experience a high work-load in their practice and at the GPC, partly consisting of non-urgent consultations. Ambulance services notice a rise in (non-urgent) emergency calls and responses, which has negative effects on the capacity and time of presence. EDs are crowding, partly as a result of more complexity (elderly, multi-morbidity) and an increased number of consultations. Moreover, all emergency care providers have difficulties attracting sufficient trained personnel and the health care budget is limited. As a response to those developments, adjustments in the organisation of emergency care are being advocated. An example is the increased collaboration between GPCs and EDs in the Netherlands.

Emergency care access points

In recent years, several GPCs have been integrated with EDs, creating an Emergency-Care-Access-Point (ECAP).(9, 10) Currently, 56% of all Dutch GPCs are collocated with the ED in an ECAP.(8) This ECAPs offers opportunities for further cooperation between the GPC and ED. The aim of this out-of-hours cooperation is to provide more (cost)efficient, patient-centred and safe emergency care. The two most eminent options for joint cooperation are the redirection of ED self-referrals to primary care and GPC access to hospitals diagnostics, like radiology.

Self-referrals at the ECAP redirected to primary care

The first possibility for further collaboration and more efficiency is the triage and treatment of self-referrals by the GPC instead of the ED.(11) In 2015 a total of 339,000 self-referred patients contacted the Dutch EDs (20 contact per 1000 inhabitants a year, 17% of all ED visits).(8) It is estimated that 50% to 80% of the self-referred patients at the ED could be treated by the GPC, at three times lower costs.(11, 14) Many Western countries are currently struggling with ED crowding, long waiting times for patients, shortages in skilled personnel and rising healthcare costs.(15, 16) The redirection of self-referrals from hospital to primary care may contribute as a solution to those problems, if the GPC is able to provide efficient and still safe emergency care for this patient group.

Access to hospital diagnostics at an ECAP

The second promising possibility for further cooperation is GPC access to the hospitals' diagnostic facilities. During office hours GPs have access to routine diagnostic facilities of the hospital (like radiology), which supports the diagnostic process and could help to distinguish between urgent and non-urgent conditions. Regularly, during out-of-hours most GPCs are not able to use those facilities. Giving the GPC access to these facilities might strengthen the GP as gatekeeper and could reduce ED referrals and consequently crowding. (17, 18)

Objectives

The aim of this thesis is to analyse the effects of cooperation between the GPC and ED at an ECAP in the Netherlands.

Specific research questions of this thesis:

What is the current organisation of out-of-hours primary care in the Netherlands and what are the latest promising developments?	Chapter 2
What are the effects on patient flows, provided care and claimed costs realised by redirecting self-referrals from the ED to the GPC at an ECAP?	Chapter 3 and 4
What are the effects of access to hospital radiology by the GPC at an ECAP on the use of diagnostics, patient flows and provided care?	Chapter 5
What are the differences in length of stay and patient satisfaction with the provided care in GPCs at an ECAP with or without access to hospital radiology departments?	Chapter 6

Outline of the thesis

To analyse the current organisation and promising developments in out-of-hours primary care in the Netherlands, a narrative review was performed, which is presented in **Chapter 2**. This thesis focuses on two important developments in the cooperation between GPC and ED at an ECAP, namely the redirection of ED self-referrals to the GPC and GPC access to hospitals radiology facilities in out-of-hours.

In **Chapter 3** a retrospective patient record analysis demonstrates the patient- and care characteristics of self-referrals treated by the GPC at an ECAP. This was supplemented with a follow-up period of three months to assess safety. An additional cost-analysis of one GPC at an ECAP is outlined in **Chapter 4**.

The effects of access to radiology in out-of-hours primary care on GP use of diagnostics and patients' flows were analysed in a prospective observational study and are presented in **Chapter 5**. In addition, the effects on length of stay and patient satisfaction are outlined in **Chapter 6**.

Chapter 7, the general discussion, presents and discusses the main findings of this thesis in the broader theoretical and practical context and provides novel ideas for the future improvement of the organisation and cooperation in emergency care in the Netherlands.

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2

The Development and Performance of Out-of-Hours Primary Care in the Netherlands; A Narrative Review

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Annals of Internal Medicine 2017;166(10):737-42.

Abstract

In many Western countries, hospital emergency departments are overcrowded, leading to the desire to strengthen primary care, particularly in out-of-hours. To achieve this goal, an increasing number of Western nations are reorganising their out-of-hours primary care systems into large-scale General Practitioner Cooperatives (GPC). This article provides an overview of the organisation, performance, and development of GPCs in the Netherlands. The Dutch out-of-hours primary care system might offer opportunities for other countries facing problems with out-of-hours care and inappropriate emergency department visits.

During the past several years, the number of contacts with Dutch GPCs has increased to 245 contacts per 1000 citizens per year. Many contacts (45%) are non-urgent, and about half occur as part of a series of primary care contacts. Low accessibility and availability of daytime primary care are related to greater use of out-of-hours primary care. To prevent unnecessary attendance at the cooperatives, physicians advocate co-payment, a stricter triage system, and a larger role for telephone doctors. More than half of the GPCs in the Netherlands have integrated with hospital emergency departments, forming “emergency care access points.” This collaboration has decreased emergency department use by 13% to 22%, and treatment of self-referrals by GPCs in emergency care access points is safe and cost-effective. Direct access to diagnostic facilities may optimize efficiency even more. Other recent developments include access to electronic health records of daytime primary care practices, task substitution from physicians to nurses, and the launch of a 2-year training program for General Practitioners to become experts in emergency care.

Introduction

In many Western countries, discussions are taking place on how to organise accessible, high-quality, and affordable care outside regular office hours and avoid unnecessary hospital visits. The desire for a stronger out-of-hours primary care system is fuelled by the current overcrowding crisis and the rising costs of hospital emergency departments (1, 2). Many European countries have reorganised out-of-hours care from small groups of physicians into large-scale primary care organisations (3). The reasons for this restructuring include reluctance by physicians to commit to being on call 24/7 because of the workload burden, increasing patient demand in out-of-hours care, and regional shortages of General Practitioners (GPs) (4, 6). Important conditions for an out-of-hours primary care system are accessibility, effectiveness, safety, efficiency, and the satisfaction of both patients and health care professionals. These topics are being studied in many European projects (7). The primary care system in the Netherlands is strong and might offer an example to other countries facing problems regarding out-of-hours care, such as emergency department overcrowding (8, 9). In 2011, we published a narrative review of previously published Dutch studies on several aspects of out-of-hours care, including experiences of both health care professionals and patients, patient safety, adherence to practice guidelines, waiting times, and telephone triage (10). In the past 5 years, important changes have been implemented in Dutch out-of-hours care in response to new challenges. Therefore, we revisited and updated our previous review.

Organisation of out-of-hours care in the Netherlands

The Dutch health care system is designed to provide equal access for all citizens. Health care insurance is offered in a regulated market; the basic insurance package is comprehensive and includes free access to primary care. All Dutch citizens are registered with a GP, who generally is consulted first for any health problem. General Practitioners act as gatekeepers: they handle more than 90% of medical problems presented, and a referral is needed for visits to medical specialists in hospitals (Table 1) (8, 9, 11, 12).

Out-of-hours primary care is provided by 119 large-scale GPCs, each of which has 50 to 250 physicians who provide care to 100 000 to 500 000 citizens (5, 10, 13). The cooperatives serve 99% of the Dutch population of 17 million and are available daily from 5 p.m. to 8 a.m. on weekdays and all hours on weekends (13). Unlike urgent care centres in many Western countries, GPCs have a nationally uniform model, are open outside office hours, use Telephone triage, always have physicians on site, and are set up and controlled by the physicians, who are members of the cooperative.

Table 1. Features of the Health Care System and General Practitioner Cooperatives in the Netherlands, by Theme*

Health care system

- All citizens have the right to health care.
- Health care insurance is compulsory, but persons may choose any insurer.
- The basic health care insurance package is almost comprehensive, and the government defines its contents.
- The basic insurance package includes primary care, inpatient and outpatient hospital care, and selected drugs. Insurers offer various types of complementary voluntary health insurance that cover dental and allied health care (such as physiotherapy).
- For most health care use, a deductible (the equivalent of US \$410 in 2017) is compulsory; exceptions are primary, obstetric, and maternity care and dental care for children.
- Children aged <18 y are insured free of charge.
- All citizens are registered with a GP who is accessible without Financial barrier and is included in the basic insurance package and excluded from the deductible.
- GPs are remunerated according to a system consisting of a capitation fee per registered patient, a consultation fee, a contribution for activities that increase efficiency or substitute for secondary care (fee for service), and compensation for providing out-hours care.
- The Netherlands spent the equivalent of US \$5601 per capita on health in 2013. Health expenditure has increased since 2000, but in recent years the increase has slowed considerably. Health expenditure as a share of gross domestic product (12.9%) is the highest in the European Union, mainly because of the long-term care sector. For hospital care and ambulatory care, the expenditure is about average.
- Between 1980 and 2013, life expectancy has increased from 75.7 to 81.0 y. Despite this increase, the Netherlands has moved from a top ranking on this indicator to a more intermediate position among European countries.
- Compared with other countries, the Netherlands has low antibiotic use, a low number of avoidable hospitalizations, and relatively low avoidable mortality.

Organisation

- Since 2000, large-scale general practitioner cooperatives have provided out-of-hours primary care in the Netherlands.
- There are approximately 120 GPCs.
- Out-of-hours is defined as between 5:00 p.m. and 8:00 a.m. on weekdays and all hours on weekends and holidays.
- Each GPC serves 100 000–500 000 patients, with an average care consumption of 250 per 1000 inhabitants annually.
- 50–250 GPs participate in a cooperative, with a mean of 4 h on call per week.
- A shift takes 6–8 h, with an hourly salary approximately equivalent to US \$69.
- Per shift, GPs have different roles: supervising telephone triage, doing centre consultations, or making home visits.

Table 1. Continued

Location

- GPCs are usually situated in or near a hospital's emergency department. 17% of patients at emergency departments are self-referrals.
- No patient is more than 30 km (18.6 mi) away from a GP.

Accessibility

- Access is through a single regional telephone number.
- Nurses supervised by GPs provide telephone triage; contacts are divided into telephone advice (by triage nurse or physician), GP clinic consultation, or GP home visit.
- Some GPCs use a central call centre for telephone triage.

Facilities

- Home visits are supported by trained drivers in identifiable, fully equipped cars (e.g., with oxygen, intravenous drip equipment, automated external defibrillator, and medication for acute treatment).
- Information and communication technology support includes electronic patient records, online connections with GP cars, and connections with electronic health records in primary care daytime practices.

* References 8 and 10–12. GP = General Practitioner (GP) .

Patients who have an urgent health problem outside office hours may contact a GPC, call the emergency number (112), or visit the hospital emergency department. Patients have access to a cooperative through a regional telephone number. Telephone triage nurses assess the urgency of a patient's health problem and determine the appropriate action to be taken. The nurse may give the patient self-care advice over the phone, invite the patient to visit a physician at the cooperative, arrange a physician home visit, or call for an ambulance. All Dutch cooperatives use the same computer-based decision-support triage system—the Netherlands Triage Standard—to support these nurses (Table 2) (14, 15). This system also is used by about half of the ambulance call centres and an increasing number of emergency departments. General Practitioners supervise the triage nurses; they may be consulted in case of doubt, and they check and authorize all calls. With regard to home visits, physicians use fully equipped cars, and medically trained drivers provide transportation and assistance (10). Most health problems are taken care of by the GPs; about 6% of all patients presenting to the cooperatives are referred to an emergency department (16).

Table 2. Urgency Categories of the Netherlands Triage Standard*

Urgency Level	Urgency Category	Description	Response Time
U0	Resuscitation	Failure of vital functions	Immediate
U1	Life-threatening	Vital functions are unstable	As soon as possible
U2	Emergent	Vital functions are threatened	Within 1 h
U3	Urgent	Risk for damage	Within a few hours
U4	Nonurgent	Negligible risk for damage	Within 24 h
U5	Advice	No risk for damage	Next working day

* Reference 14.

In earlier years, concerns were expressed regarding patient safety at the cooperatives because of the high patient throughput, use of nurses for telephone triage, and risk for errors caused by potential discontinuity in information (17). However, a retrospective medical record study in the Netherlands showed patient safety to be high (18). Moreover, cooperative physicians use the same national physician association guidelines that they use during their daytime work, and adherence rates are high (19). Finally, both patients and professionals reported being satisfied with the out-of-hours primary care system (20, 21).

Performance

Use of general practitioner cooperatives

The number of contacts with GPCs has been increasing since 2005 (Figure). In 2015, 245 in 1000 citizens contacted a cooperative. About 40% of contacts are telephone consultations, 50% clinic consultations, and 10% home visits (13). The out-of-hours cooperatives are meant to address urgent help requests that cannot wait until the next day. However, in practice, a large portion (45%) of these requests have been considered non-urgent from a medical perspective (13).

We examined the reasons patients sought out-of-hours primary care by looking at cases classified as non-urgent in 4 cooperatives from 2009 to 2012. The most frequently mentioned motives were worry (42%), the need to see a physician (34%), and a desire for medical information (26%) (22). In 2012, we surveyed Dutch physicians regarding strategies to influence out-of-hours primary health care use. Almost all the physicians felt that the number of patient contacts could be reduced. Measures they believed to be both desirable and effective included patient co-payments, stricter triage, and a larger role for telephone consultation physicians (23). Usage rates vary among GPCs. A 2011 study of 21 cooperatives found that socio-demographic characteristics explained much of the variation in health care

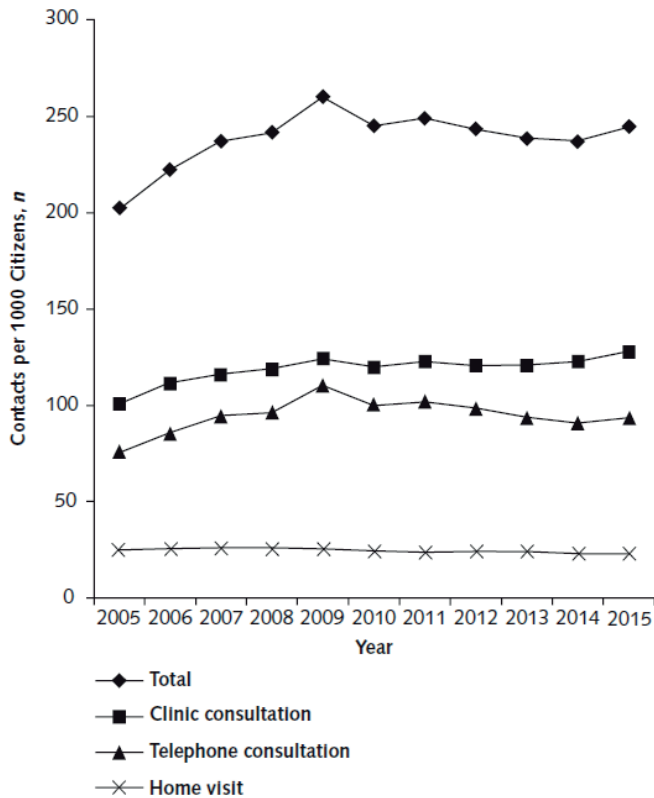


Figure 1. Number of contacts per 1000 citizens, by contact type.

use among cooperatives. Demand was statistically significantly higher in neighbourhoods with more women, low-income households, and non-Western immigrants; a greater degree of urbanization; and lower socioeconomic status (24). Usage also varies among primary care practices within a cooperative. In 2011 to 2012, we studied the variation in out-of-hours health care use among patient populations from 100 daytime primary care practices at five cooperatives. Aside from patient population characteristics (for example, young children or foreigners), organisational characteristics of primary care practices, such as longer telephone waiting times or less availability of GPs to their patients in the palliative disease stage, were associated with greater use of out-of-hours cooperatives (25).

Triage

In the first years after the GPCs were launched, the focus was on the safety of the telephone triage system (17). More recently, this system has become professionalized with mandatory training for triage nurses and the use of a national computer-based triage system. In a study using data from 29 cooperatives from 2008 to 2010, we found that the quality of the triage conversation is associated with the appropriateness of the triage decision (26). Therefore, monitoring the quality of calls and providing continuous education and feedback are important. We developed and validated an observational instrument called KERNset to assess the quality of telephone triage (27). KERNset comprises a minimum of 22 items that may be used by trained raters to retrospectively measure the quality of audio recorded triage calls. It was implemented nationally in 2016. Currently, physicians' main concern is triage inefficiency: Too many patients with less-urgent health problems are being allocated to face-to-face contacts at GPCs (23). This issue has arisen because of the increase in patients contacting cooperatives and the high workload of physicians. However, in studies of 2 cooperatives in 2013 and 2015 that examined differences in urgency assessments among triage nurses (during telephone consultation) and GPs (after consultation), we found that most face-to-face contacts (68% to 79%) were medically necessary. Of the medically unnecessary phones, 16% to 22% were understandable from the patients' perspective (for example, because of worry or pain), and only 5% to 11% were redundant. Of all medically unnecessary face-to-face contacts, 63% to 69% could have been avoided by a telephone consultation with a GP (28, 29). Finally, a 2012 study of 17 cooperatives found a statistically significant variation in urgency levels among the cooperatives, even for the same health problem. This variation was associated mainly with differences in patient characteristics (such as sex and age) that likely reflect patients' clinical needs. It was not associated with use of the triage system (30).

Follow-up contacts

We examined whether patients who had contacted a cooperative had subsequent encounters related to their initial health problem. In a study using data from 2003 to 2009 from 59 cooperatives, more than half (52%) of the patients had a follow-up encounter with a daytime primary care practice or another contact with the out-of-hours cooperative (31). An analogous study using data from 2009 to 2011 from 16 cooperatives, including follow-up contacts with other health care services, found a similar result: 47% of the patients had a follow-up contact, usually with their primary care practice (32). The probability of follow-up contact was greater in patients who were older (aged ≥ 65 years) (31, 32), had been visited at home (31, 32), or had received care from a cooperative with a higher percentage of telephone consultations (32). It was lower among patients with more positive experiences (32). Access to a daytime primary care practice before contact

with a cooperative also was a strong predictor of follow-up communication (31). We conclude, therefore, that many patient contacts with GPC are part of a disease episode including several primary care contacts.

New developments

Collaboration with emergency departments

During the past few years, the most prominent change in out-of-hours care in the Netherlands has been the increasing proportion of GPCs that collaborate with and are located within hospital emergency departments (56% in 2015) (13). At these shared sites, known as emergency care access points, GPs generally are responsible for the triage and treatment of self-referrals (walk-in patients), who otherwise would present to the emergency department outside office hours. Of all emergency department contacts, 17% are self-referrals (33). We evaluated this type of organisation at 3 emergency care access points by using data from 2011 to 2012. Self-referral cases mostly were trauma related, were of low urgency, and occurred in male patients. After consultation with a GP, 24% of these patients were referred to the emergency department, mostly for radio-diagnostics (53%). Thirty percent had a follow-up contact, mostly with the daytime primary care practice and rarely with the emergency department (34). We also conducted a before-and-after study at one location, comparing data from 2006 to 2008 (before the site became an emergency care access point) with those from 2009 to 2011 (when it was an emergency care access point). The reorganisation resulted in a 13% decrease in overall emergency department use, the near absence of self-referring patients at the emergency department in out-of-hours, and a greater probability of hospital admission and clinical follow-up (35). A study in 2011 (36) and another in 2013 (37) compared 3 emergency departments that were part of an emergency care access point with 3 that were not. The 2011 study found a 22% decrease in overall emergency department use (36). The 2013 study found that patients at emergency care access points were older and more likely to be referred to the emergency department and hospitalized (37). We conclude that treatment of self-referrals by the GPC at emergency care access points is a safe and cost-effective alternative to providing care at emergency departments and that increased collaboration between out-of-hours primary and emergency care providers seems to optimize the use of emergency departments, which might help alleviate their overcrowding.

Access to electronic health records

During the past few years, the number of Dutch GPCs with access to electronic health records of daytime primary care practices has increased rapidly. A patient's health records may be examined only with his or her permission, and about 50% of Dutch patients have

given their consent. Health record accessibility contributes to continuity of care and safety and helps prevent unnecessary actions (8). Electronic exchange of information is important because many patient contacts at cooperatives are part of a series of primary care contacts, as mentioned earlier. The electronic health record, if accessible, is examined during telephone triage for information regarding medical and physical history, diagnostic results, medications, and individual work plans.

Access to diagnostic facilities

One way to increase the efficiency of GPCs is through direct access to hospital diagnostic facilities, such as radiologic imaging, which currently is limited although increasing (38). This might reduce the number of patients referred to hospitals; as mentioned earlier, the reason that 53% of self-referred patients are sent to the emergency department by GPCs is to obtain radio-diagnosis to rule out fractures in case of musculoskeletal trauma (34). We currently are investigating the effects of direct access to radiology on patient outcomes. Access to other diagnostic facilities, such as ultrasonography and point-of-care testing, might further optimize care at GPCs.

Task substitution by nurses

Another development in Dutch GPCs is task substitution from physicians to specialized nurses. Positive outcomes from this approach are reported in the literature, both in daytime general practices and at out-of-hours cooperatives, in terms of physician workload, patient experiences, and care outcomes (39). A quasi-experimental study at 1 cooperative in 2011 to 2012 showed that nurses can adequately handle 77% of all consultations within the centre (40). Currently, we are examining the effects of home visits by specialized nurses.

Training program

Because of the developments and rapid changes in emergency care, the need arose to have GP experts in this field. In collaboration with the Dutch GP association, two university medical centres developed a 2-year training program for physicians to improve their emergency care knowledge and skills. Graduates of the course are motivated to play a role in designing research, developing guidelines, strengthening collaboration with many partners, or managing cooperatives, or to become trainers themselves. The first 17 candidates are expected to graduate in 2017.

Discussion

In the 15 years since the out-of-hours GPCs were launched in the Netherlands, the system has improved. The most prominent change in the past 5 years has been the integration of more than half of the cooperatives with hospital emergency departments, forming emergency care access points, each of which provides an entry point for patients. After triage, patients usually are sent to a GP or to a specialist in the emergency department. This process has resulted in a statistically significant decrease in emergency department use.

Treatment of self-referred patients by GPs in emergency care access points is a safe and cost-effective alternative to emergency department care. Because direct access to diagnostic facilities may further improve efficiency, this approach is being evaluated in a multicentre study. During the past several years, the number of patients contacting GPCs has increased, and a large percentage of these requests for medical help are non-urgent. Physicians have criticized the triage system for being inefficient and resulting in too many clinic consultations, and they advocate for a larger role for “telephone doctors” to support triage nurses. Improving the accessibility and availability of daytime primary care, moreover, might be an effective way to make the use of out-of-hours care more appropriate and efficient. The Dutch model of GPCs, especially in the form of emergency care access points, may provide opportunities for other countries considering remodelling their system of out-of-hours care. Nations wishing to transform their current out-of-hours primary care system to set up GPCs must consider the wider health care system and may have to meet additional requirements, including primary care investments (41). In the Netherlands, a future challenge will be to alleviate the out-of-hours workload by redirecting patient flow to daytime primary care practices and to reduce avoidable hospital admissions.

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3

Patient and care characteristics of self-referrals treated by the general practitioner cooperative at emergency-care-access-points in the Netherlands

3

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Abstract

Background: In the Netherlands, out-of-hours primary care is provided in general practitioner-cooperative (GPCs). These are increasingly located on site and in collaboration with emergency departments of hospitals (ED). At such sites, also called emergency-care-access-points (ECAP), the GPC is generally responsible for the triage and treatment of self-referrals who used to attend the ED. To evaluate the effects and safety of this novel organisation, we studied the characteristics and the quality of care given by GPCs to self-referrals at ECAPs.

Methods: Retrospective analysis (August 2011–January 2012) of 783 records of self-referred patients at three Dutch GPCs in an ECAP. This was supplemented with a retrospective analysis of patient records during a follow-up period of three-months to assess safety.

Results: Patient-characteristics: 59% was male, 46% aged between 16–45 years and 59% trauma-related. Most cases (95%) were triaged low-urgent. None received the highest urgency-category. Quality: The triage outcome was correct in 79%, underestimated in 12% and overestimated in 9%. After GP consultation 20% were referred to the ED, mostly for radio-diagnostics. Of the referrals to secondary care, 98% were according to common medical practice. Thirty percent had a follow-up contact, mostly with their own general practitioner, seldom with the ED. Complications, all non-severe, were registered in 3.2%; 0.4% were possibly preventable.

Conclusions: Self-referred patients at an ECAP are mostly trauma related, low-urgent and male patients. The majority could be treated by the GPC without subsequent referral to the ED. Care given at the GPC is reasonably efficient and safe. Triage and treatment of self-referrals by the GPC at ECAPs might offer opportunities for other countries facing problems with inappropriate emergency department visits.

Background

The Netherlands have a strong primary care system. Most Dutch inhabitants have a general practitioner (GP), acting as a gatekeeper to hospital care. Patients who seek urgent medical care are however free to contact the GP, call the emergency number (112), or visit the emergency department. Out-of-hours (emergency) primary care is provided in GP-cooperatives (GPCs) Table 1 (1, 2). These are increasingly located on site and in collaboration with the accident and emergency departments (ED) of hospitals, forming an Emergency Care Access Point (ECAP) (3, 4). At most of these co-located sites, the GPC is responsible for triage and treatment of self-referrals (4). These patients were formerly able to consult the ED on their own initiative, without a referral of the GPC.

Table 1. Features of general practitioner cooperatives and emergency care access points in the Netherlands (1,3,12)

Theme	Feature
General	<p>Out-of-hours primary care is provided by large-scale general practitioner cooperatives (GPC)</p> <p>Out-of-hours is defined as daily from 5 p.m. to 8 a.m. the entire weekend, and public holidays</p> <p>Participation of 50–250 GPs per cooperative with a mean of 4 hours on call per week</p> <p>Population consists of 100,000 to 500,000 patients</p> <p>At present there are 121 GPCs</p>
Location	<p>Distance of patients to GPC maximally 30 km</p> <p>56% of GPCs is co-located with the ED of a hospital, forming an Emergency Care Access Point, 7% is located on the site of the hospital premises (without collaboration), 11% in the vicinity of the hospitals and 26% elsewhere</p>
Accessibility	<p>Access generally via regional telephone number. First contact is mostly telephonic with a triage nurse (90-95%), infrequently as self-referral.</p> <p>Telephone triage by nurses supervised by GPs: contacts are divided into telephone advice (38%), centre consult (52%), or GP home visit (10%).</p> <p>Triage outcomes (NTS: Dutch Triage Guidelines): Life threatening (U1) 2%; Acute (U2) 15%; Urgent (U3) 38%; Routine (U4) 18% ; Advice (U5) 27%</p> <p>The GPC in an ECAP is mostly responsible for the face-to-face triage of self-referrals (54%). The ED is responsible for face-to-face triage in 21%. In 15% the triage is performed according to the patients choice. The remaining 10% has a deviant organisation.</p> <p>In the Netherlands, adult patients have to make an annual deductible (€385,- in 2016) for hospital care and diagnostics. GP and GPC care is fully covered, without a co-payment.</p>
Facilities	<p>Glucose testing and urine examination can be performed at all GPCs. An ECG is available in 26%, conventional radiology in 19% and routine laboratory test in 37-65%.</p>

Self-referrals at the ED in the Netherlands are typically young men with trauma related complaints (5, 6). They claim expensive specialist care and cause unnecessary attendance of the ED and longer waiting times (3, 6–10). As in many Western countries, the Dutch EDs are increasingly struggling with overcrowding. Studies indicate that self-referred visits account for an average of 17% of all ED visits in the Netherlands, with a range of 3–58% (8, 10). An estimated 51–80% of those self-referred patients could have been treated at the GPC, although the actual percentage has never been investigated (5, 11).

Due to increasing collaboration at ECAPs, these patients are now initially sent to the GPC, which is responsible for triage and subsequent treatment (4). Recently, after establishing ECAPs a reduction in self-referral rates has been demonstrated at the ED (10, 12). Although this substitution has a lot of social and political support in the Netherlands, concerns were expressed about the quality and safety of care provided by GPs especially in high-urgent emergencies. Therefore, we studied the quality of care given by GPCs to self-referrals at ECAPs.

Methods

Design and population

We carried out a retrospective patient record analysis of self-referrals attending the GPC of an ECAP. This was supplemented with a follow-up patient record study of three months at their own general practices. From August 2011 up until January 2012 we selected self-referrals from three GPCs in the Eastern part of the Netherlands. The selection procedure of self-referrals varied due to different sizes of ECAPs and logistic reasons. At the first GPC, all self-referrals during a two month period were selected ($n = 295$). At the second GPC, the researchers selected all self-referrals from a representative selection of seven participating GPs during a five month period ($n = 301$). Those GPs were chosen based on size of their practice, organisation and localisation. At the third GPC, the First sixty self-referrals of the month were selected, during a five month period ($n = 300$). Contacts were excluded in case of incomplete files or subsequent visits.

Data collection

The data collection procedure consisted of four steps:

1. The medical records were extracted from the registration system of the GPC, providing information concerning the GPC visit. The researchers had access to the patients' records of their own GP for the three subsequent months. This provided information about all possible contacts with healthcare workers (own GP, GPC, Out Patient Department Hospital, ED, ambulance emergency services, diagnostics).

II. The following routine variables were coded by one medical educated researcher:

- Patient characteristics: gender, age, living area, urgency, eventual diagnosis (ICPC).
- Care characteristics: diagnostics, treatment, referral to ED, reason for referral, subsequent advice.
- Follow-up: follow-up contacts, complementary diagnostics, alterations in diagnostics or treatment by the GP or specialist, possible complications.

Subsequently, two medical educated researchers independently assessed a number of subjective variables:

- Urgency: adequacy of triage in retrospect, using the urgency categories of the Dutch NHG-Triage
- Index (13). The assessment of the adequacy of triage was made in two of the three GPCs, because one GPC used a deviating triage tool.
- Guidelines: applicability of guidelines formulated by the Dutch College of General Practitioners (14).
- Clinical management: appropriateness of the diagnostics, treatment and referral according to guidelines (if applicable) or common medical practice.
- Adverse events: unintended harm to the patient and preventability.

III. The assessment of both researchers on the subjective variables were compared. As a next step, the researchers assessed the files in which they initially did not agree (panel 1).

IV. The cases without consensus after a discussion in step III were discussed with an experienced GP, as long as needed to reach consensus (panel 2).

Part of our data (mainly patient- and care characteristics) were used for a publication in a Dutch journal for General Practitioners (15).

Ethics and privacy

The Ethical Research Committee of the Radboud University Medical Center Nijmegen was consulted and concluded that this study does not fall within the remit of the Dutch Medical Research Involving Human Subjects Act (Wet Mensgebonden Onderzoek). All general practices gave their written permission for gathering and analysis of the patient records. To guarantee privacy, all researchers processed the data anonymously besides signing a declaration of confidentiality.

Analyses

SPSS 20 (Statistical Package for Social Sciences) was used for data analyses. Study results were described using descriptive statistics and frequency tables.

Results

Inclusion and exclusion

In total 896 patients were selected. During analysis, 113 GPC contacts were excluded due to incomplete registration or subsequent visits at the GPC (16%). The remaining 783 records were further analysed.

Agreement

The reviewers initially agreed on 543 (69%) of the medical records. In 240 (31%) records there was a discrepancy in one or more of the following variables: urgency, guideline applicability, clinical management and adverse events. After discussion between the two reviewers, there was consensus on 753 (96%) of all records. A discussion with the third reviewer resulted in consensus for all records.

Objective characteristics

Patient characteristics

Table 2 shows the patient characteristics of the 783 self-referrals. Of these patients 59% was male. The mean age was 34.1 years; 46% was aged between 16 and 45 years. Their living area was mostly urban (65%). In 59% of the contacts, the patient had a trauma, most often a wound (24%), a suspicion of a fracture (16%) or another type of injury of the musculoskeletal system (13%). The diagnoses for self-referrals without trauma (39%) were rather varied.

Table 2. Characteristics of the study population

Characteristic	n	(%)
Gender (n=783)		
• male	459	(58.6)
• female	324	(41.4)
Age (n=783)		
• 0-15 years	184	(23.5)
• 16-45 years	361	(46.1)
• 46-65 years	150	(19.1)
• 65> years	88	(11.2)
Living area (n=783)		
• urban	509	(65.0)
• rural area	274	(35.0)

Table 2. Continued

Characteristic	n	(%)
Urgency (n=533)† *		
• U1: Life-threatening	0	(0)
• U2: Acute	25	(4.7)
• U3: Urgent	344	(64.5)
• U4: Routine	164	(30.8)
Diagnosis (ICPC) (n=783)		
<i>Trauma</i>	463	(59.1)
• wound	186	(23.8)
• suspicion of fracture of extremity	122	(15.6)
• contusion/distortion of musculoskeletal system	106	(13.5)
• multiple injury after trauma	26	(3.3)
• traumatic nose injury	14	(1.8)
• traumatic cranial injury	9	(1.1)
<i>Non trauma</i>	320	(40.9)
• abdominal complaints	41	(5.2)
• ocular complaints	34	(4.3)
• musculoskeletal (non-traumatic)	27	(3.4)
• myogenic complaints	20	(2.6)
• skin complaints	20	(2.6)
• thoracic pain	17	(2.2)
• respiratory complaints	14	(1.8)
• other	147	(18.8)

† Data refer to two out of three GPCs (second and third). * Urgency U5 was introduced in the triage guidelines in 2012

Of the 533 self-referrals assessed for adequacy of triage, 508 (95%) presented themselves with a lower urgency (level U3 or U4). The highest levels of urgency (U1) did not occur (Table 2). The patient characterises in the three GPCs were generally comparable.

Clinical management

In 580 cases (76%) the GPC was able to treat the self-referrals without referring. Twenty percent was referred to the ED after being seen by the GP. Only 4% was referred to the ED directly after triage (high urgency or need for diagnostics). The reason for referral in 102 cases (53%) concerned a request for X-ray diagnostics because of a suspected fracture (Table 3).

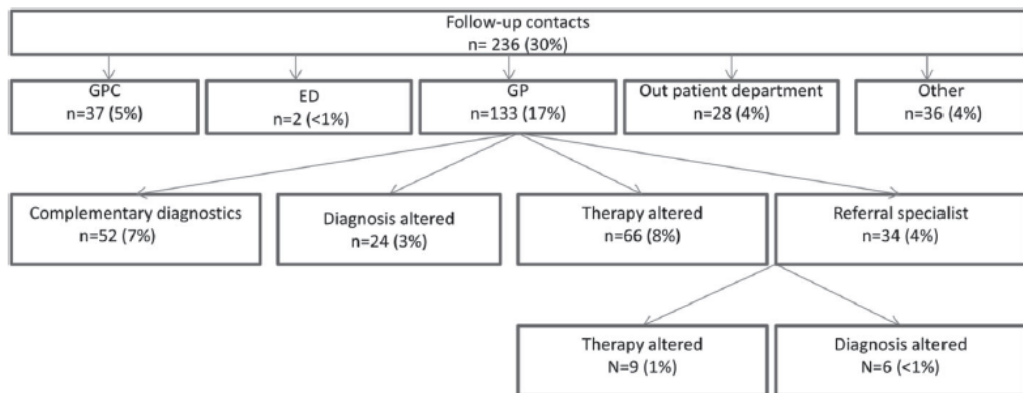


Figure 1. Follow-up contacts, diagnostics and treatment. Note: Percentages of total of 783 contacts. Multiple answers possible: for instance a General Practitioner could request complementary and alter the diagnostics and/or treatment.

Follow-up

Figure 1 provides an overview of the follow-up after the initial contact at the ECAP. Out of 783 self-referrals 236 (30%) had a follow-up contact. In 113 cases (17%) this concerned a contact with the patient's own GP, in 37 cases (5%) the GPC. Only two self-referrals (0.3%) visited the ED, while the Dutch national emergency number 112 was never used. After the initial contact at the GPC the patient's own GP performed complementary diagnostics in 52 patients (7%). In 24 cases (3%) the GP altered the diagnosis and in 66 cases (8%) the treatment was changed; 34 patients (4%) were referred to a specialist by their own GP.

Subjective characteristics

Adequacy of triage

Table 4 shows the results of the judgment of the researchers about the correctness of the urgency level at triage. In 421 contacts (79%) the researchers judged in retrospect that the triage category was correct. In 63 contacts (12%) the urgency was underestimated by the triage nurses (undertriage) while in 49 cases (9%) it was overestimated (overtriage) (Table 3). Eighteen contacts (2%) were mistakenly judged by the triage nurses as being of lower-urgency (U3-U4), while in retrospect these turned out to be of the high-urgent (U1-U2) (not in table). However, this under-triage did not have any harmful consequences for the patients.

Table 3. Incorrect triage per urgency category

Urgency	Incorrect triage		Over triage		Total	
	n	(%)	n	(%)	n	(%)
U1 Life-threatening (n=0)	–		–		–	
U2 Acute (n=25)	2	(8.0)	7	(8.0)	9	(36.0)
U3 Urgent (n=344)	15	(4.4)	42	(4.4)	57	(16.6)
U4*Routine (n=164)	46	(28.0)	-	(28.0)	46	(28.0)
Total†	63	(11.8)	49	(11.8)	112	(21.1)

* Overtriage is by definition not possible at the lowest level of urgency.

† Data refer to two out of the three GPCs (second and third).

Guidelines

In 564 cases (72%) there was no guideline of the Dutch College of General Practitioners applicable according to the researchers. In 157 (72%) of the remaining 219 cases the GP adhered to the guidelines. The guidelines that were most often applicable were Injuries to the ankle ligament (19%), Red eye (15%), Traumatic knee problems (11%) and Acute coronary syndrome (7%).

Clinical management

According to the researchers, 619 self-referrals (79%) received the right type of diagnostics (anamnesis, physical examination, diagnostics). Inadequacies in recorded anamnesis or physical examination were predominantly the reason for cases in which the diagnostics were considered inadequate. Trauma screening to assess the risk of serious injury was often lacking during anamnesis. In 666 cases (85%) the clinical management of the GP was considered appropriate. Predominant reasons for inappropriate clinical management (15% n = 117) were no or insufficient follow-up advice (51%), and no or incorrect type of medication prescription (38%). Of all referrals, 187 (98%) were judged correct.

Adverse events

None of the patients from the research population died or suffered from permanent adverse events. Complications related to GPC care occurred in 25 (3,2%) patients, of which three (0,4%) could have possibly been prevented (missed fracture hand, not recognized small arterial haemorrhage in a hand wound, infection due to poor dressing of a crush injury of a finger). Examples of unpreventable complications were delayed wound recovery and infection of the wound; these complications were related to their anatomical location or with co morbidity.

Discussion

Main findings

Insight into the quality of treatment of self-referrals at the GPC is highly relevant, due to the fact that the GPC and the ED have started working together more closely in ECAPs in the Netherlands. The GPC is increasingly responsible for the care provided for self-referrals, previously often provided by the ED. This collaboration contributes to reduce ED crowding. Patient characteristics and quality of care for self-referrals provided by the GPC at an ECAP have never been analysed.

Our study shows that care for self-referrals at the GPC is mostly low-urgent. Patients are often of young age, male and frequently present themselves with trauma. This corresponds with previous studies on self-referrals at the ED (3, 5, 6). The triage performed by the GPC was considered correct in the majority of cases. However the urgency was underestimated in 12%, predominantly in the lowest urgency category (U4). Under-triage could generate potential harmful situations, although only 2% were mistakenly triaged as lower-urgent (U3-U4), while being high-urgent (U1-U2). The GPC is able to treat three quarters of all self-referrals, whereas a quarter was referred to the ED, mostly for conventional radio-diagnostics (53%). Almost all referrals to the ED were considered appropriate. In the majority of our cases the diagnostics applied and followed treatment were considered correct. Only one-third of all self-referrals had a follow-up contact, mostly with their own GP and seldom at the ED. Follow-up showed that a small number of patients suffered complications, none of these were serious adverse events. All these findings illustrate that a Dutch GPC is able to provide relative safe and effective care for self-referrals. In the Netherlands, as well as in many Western countries, emergency departments are overcrowding (16, 17). The triage and treatment of self-referrals at an ECAP by the GPC should be considered as an efficient and presumably economical alternative for care at the ED. In this manner, the GP(C) maintains its role as a gatekeeper to hospital care (18, 19). Besides, it can reduce overcrowding at ED, by limiting the patients inflow. The Dutch system might therefore offer opportunities for other countries facing problems with inappropriate emergency department visits.

Strengths and weaknesses

One of the strengths of our study is that we did not only study contacts at the GPC, but also follow-up contacts for a three months period in other healthcare settings. This way we gained insight into the safety of care and eventual complications. Our study shows the actual percentage of referrals from GPC to ED and is not based on estimations as in earlier studies. The majority of the variables were based on objective data. The subjective variables were independently assessed and thoroughly analysed by two medically educated researchers.

The assessments of both researchers on the subjective variables were compared and if necessary discussed. The researchers based their final judgment on guidelines, consensus discussions and expert consultation.

It is unclear whether the results can be generalised to other GPCs in the Netherlands or internationally. However, the results are generally the same for each of the three participating GPCs, which contributes to the generalisability. Nevertheless, population characteristics, local agreements and local customs in relation to care for self-referrals can differ considerably between GPCs, especially in metropolitan regions. Our study concerns a retrospective analysis of records, in which the issue of under-registration should be taken into account. The number of patients included in this study is limited, as a result no reliable conclusions could be drawn on the occurrence of adverse events and safety. Nevertheless this study gives some insight on safety of care for self-referred patients by the GPC.

Implications for practice and further research

The collaboration between a GPC and ED in ECAPs is successful, safe and efficient. The triage under responsibility of a GPC seems to be professional and safe. The percentage of potentially harmful under triage should however be reduced. This could be realised by offering training in face-to-face triage to triage nurses and adjustments and clarifications in the triage guidelines. GPs at a GPC provide efficient care, as only 20% of the patients were eventually referred to the ED. As a result, the ED could concentrate on providing high urgent complex emergency care, leading to a reduction in waiting and process times (3, 7–9, 18). Although controversial in literature, a cost reduction is expected for this setting (8, 20). Despite we did not find any adverse events in this study, further studies with larger patient numbers are advisable. Further studies on the effects of GPC care for self-referrals at other (metropolitan) ECAPs is recommended to assess the generalisability of the results. Care for self-referrals in this setting consists mostly of trauma with a low-urgency. Increasingly GPCs are experimenting with nurse practitioners providing care for those patient categories. Positive outcomes are reported in the literature, both in daytime general practices and at GPCs, in terms of physicians' workload, patients' experiences, and care outcomes (21). A study at one GPC showed that nurses can adequately deal with 77% of all consultations (22), but further studies on this subject are recommendable.

Further improvement in collaboration and efficiency could be realised by giving the GPC access to hospital diagnostic facilities (laboratory and conventional radiology). Currently, the diagnostics available for the GPC are limited and varied, only 19% has (restricted) access to conventional radiology (23). Literature shows that GPs tend to use less resources compared to ED clinicians (9, 24). The main reason for self-referrals to attend an ED is an expected need for diagnostics (11, 17). This study shows that 53% is referred by the GPC for

conventional radio-diagnostics and less than half is expected to have an actual fracture (3). By giving a GPC access to diagnostics, an additional reduction in referrals could be realised. Further research on those topics is recommended.

Conclusion

Self-referrals at the ECAP are mostly young men. They frequently present with, trauma-related symptoms. Mostly it concerns low urgent care. The vast majority of self-referrals at the ECAP were treated by the GPC without subsequent referral to the ED. Treatment of self-referrals by the GPC should be considered as a safe, efficient and probably economical substitute for care at the ED and could help to reduce ED crowding.

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4

Cost analysis of self-referrals triaged and treated at a general-practitioner-cooperative in the Netherlands

4

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Submitted

Abstract

Objectives: In the Netherlands, out-of-hours primary care is provided by general practitioner cooperatives (GPC). These are increasingly located on site and in collaboration with emergency departments (ED). Here, the GPC is mostly responsible for the triage and treatment of self-referrals who used to attend the ED directly. Self-referrals at the ED cause unnecessary utilization, overcrowding and probably higher costs. The aim of this study is to analyse the effects on healthcare costs realised by redirection of self-referrals to the GPC instead of the ED.

Methods: A retrospective analysis (2011-2012) of 300 records of self-referred patients at a Dutch GPC, combined with a three-months follow-up period, supplemented with a cost analysis. Claim data were used to analyse the total and average costs for self-referrals attending at the GPC and to calculate the cost reduction.

Results: The 248 self-referrals at the GPC claimed on average €217, of which 193 (78%, mostly low-complex) were treated by the GPC only with average costs of €84 per patient. The remaining 55 (22%, mostly high-complex) patients were subsequently referred to the ED, with average costs of €684 per patient (including GPC-rates and follow-up).

Conclusions: Our study shows the patient flows and actual costs of self-referrals directed to the GPC instead of the ED. The majority could be treated by the GPC without ED referral. The care for these low-complex patients at the GPC is three times cheaper than the ED. Considerable cost reduction can be realised by redirecting self-referrals to the GPC instead of the ED.

Introduction

Currently, many Western countries are struggling with Emergency Department (ED) overcrowding and the negative effects it has on quality and safety of care. This overcrowding is partly caused by self-referrals attending the ED instead of consulting primary care. In the Netherlands, out-of-hours primary care is provided by general practitioner cooperatives (GPCs), which are often situated in the close proximity of the ED. (Box 1) These sites, called emergency care access points (ECAPs), offer possibilities for further cooperation between the GPC and ED.(1) The aim of this collaboration is to provide appropriate and efficient care at the right place, by the right professional, and at the right time. This might cause a reduction in unnecessary ED consultations, overcrowding and healthcare costs.

Box 1: Features of general practitioner cooperatives at emergency care access points in the Netherlands (1-3)

Theme	Feature
General	<p>Out-of-hours primary care is provided by large-scale GPCs</p> <p>Out-of-hours is defined as daily from 5 p.m. to 8 a.m. the entire weekend, and public holidays</p> <p>Participation of 49–818 GPs per GPC with a mean of 4 hours on call per week</p> <p>Population consists of 100,000 to 500,000 patients per GPC</p> <p>At present there are 120 GPCs with yearly 4.3 million contacts serving 17 million inhabitants</p> <p>250.000 self-referral contacts a year are registered at the GPCs (6% of the population)</p> <p>The total costs for out-of-hours primary care by GPCs is €322 million (€18,95 per patient) a year</p>
Location	<p>Distance of patients to GPC maximally 30 km</p> <p>67% of GPCs is co-located with the ED of a hospital, 90% has a pharmacy on site</p>
Accessibility	<p>Access generally via regional telephone number. First contact is mostly telephonic with a triage nurse (90-95%), infrequently as self-referral</p> <p>Telephone triage by nurses supervised by GPs: contacts are divided into telephone advice (39%), centre consult (52%), or GP home visit (9%)</p> <p>Triage outcomes (NTS: Dutch Triage Guidelines): Life threatening (U1) 3%; Acute (U2) 16%; Urgent (U3) 39%; Routine (U4) 15% ; Advice (U5) 27%</p> <p>The GPC in an ECAP is mostly responsible for the face-to-face triage of self-referrals (60% of the ECAPs). The ED is responsible for face-to-face triage in 16% and in 9% the triage is performed according to the patients choice. The remaining 15 % has a deviant organisation. In the Netherlands, adult patients have to make an annual deductible (€385,- in 2018) for hospital care and diagnostics. GP and GPC care is fully covered, without a co-payment.</p>
Facilities	<p>Glucose testing and urine examination can be performed at all GPCs. An ECG is available in 26%, conventional radiology in 19% and routine laboratory test in 37-65%.</p>

An example of the collaboration at an ECAP is the triage and treatment of self-referrals by the GPC instead of the ED. Recently published studies on self-referrals treated by the GPC at an ECAP show that three quarters were treated in the primary care setting without subsequent referral to the ED.(4-5) The care given at the GPC is well valued, reasonably safe and presumably cost-effective.(4) The associated costs for self-referred patients are estimated to be 2 to 5 times higher at the EDs compared to the GPC.(6-8) In this study we describe the actual costs of self-referred patients attending a GPC at an ECAP in the Netherlands. The aim of this study is to determine the effects on healthcare cost realised by triage and treatment of self-referrals by the GPC at an ECAP instead of the ED.

Methods

Design and population

We carried out a cost analysis based on data from a Dutch GPC at an ECAP in the eastern part of the Netherlands. At first we did a retrospective patient record analysis at the GPC of self-referrals attending. This was supplemented with a record review over a three months follow-up period at the general practice of the index patients.(6) During five months (September 2011 – February 2012), we included the first sixty self-referrals a month at the GPC. Patients with an incomplete record at the GPC were excluded.

Data collection

The medical records of the included patients were extracted from the registration system of the GPC. The researchers also had access to the patients' records of their own GP for the three subsequent months. This provided information about the patient and care characteristics of self-referrals treated by the GPC and possible subsequent contacts. After anonymization, the following routine variables were coded: number of GPC contacts, diagnostics, treatment, possible referral to ED, possible follow-up contacts (GP, GPC, ED) in the contiguous three months, complementary diagnostics and treatment. These data were used to calculate the actual claimed costs for self-referrals treated by the GPC in the Netherlands.

The Dutch Healthcare Authority (Nederlandse Zorg Autoriteit, NZA) provided the invoiced amounts for the GP and GPC consultation.(9) The Netherlands hospitals charge standard fees per diagnosis per patient. The hospital provided the costs per patient for those referred to the ED (including possible follow-up at the outpatient department). Additional costs for medication and diagnostics were calculated using available data provided by the Dutch health insurance companies.(10) On this basis we could determine the total and the average costs per self-referred patient attending the GPC. We made a distinction between self-referrals treated by GPC only, and those later on referred to the ED.

Ethics and privacy

The Ethical Research Committee of the Radboud University Medical Center was consulted and concluded that this study does not fall within the remit of the Dutch Medical Research Involving Human Subjects Act (Wet Mensgebonden Onderzoek). The general practices gave their written permission for analysis of the patient records. Patients were not separately asked for consent. To guarantee privacy, all researchers processed the data anonymously by assigning a study number after inclusion. Besides, they signed a declaration of confidentiality.

Results

Inclusion, exclusion and patient flows

Fifty-two of the 300 selected patients were excluded due to incomplete files (17%). Of the remaining 248 patients, 193 (78%) were exclusively treated by the GPC and 55 (22%) subsequently referred to the ED. Of the 193 patients treated exclusively at the GPC, 26 (14%) received solely advice after triage and 167 (86%) were treated by the general practitioner at the GPC (Table 1).

Patient characteristics

The mean age of the 248 self-referrals included was 35.1 years and the majority was male (62%). In 52% of the contacts, the patient had a trauma, most often a wound (21%), a suspicion of a fracture (13%) or another type of injury of the musculoskeletal system (11%). The diagnosis for self-referrals without a trauma were rather varied (48%). The main reason for ED referral was the request for further radiological assessment in case of trauma (59%). In 4 cases, direct emergency department urgent care was necessary (2%).

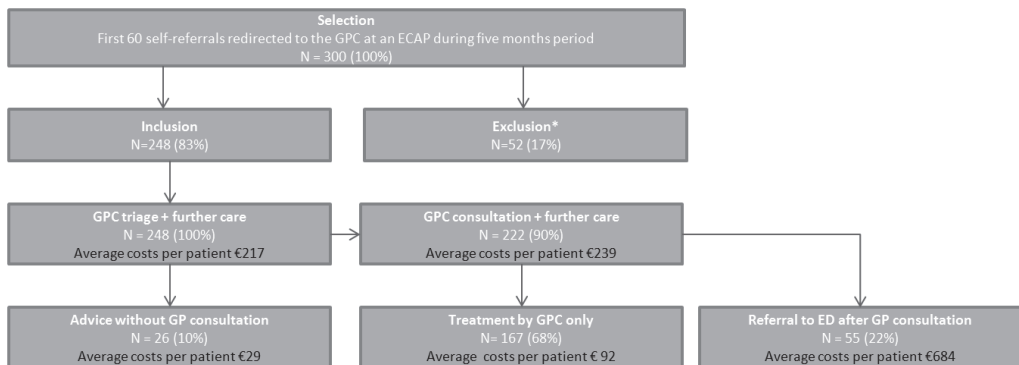
Costs of self-referrals

The average medical costs of all 248 patients initially presenting at the GPC were €217. The 193 patients treated exclusively by the GPC claimed of €84 per patient. Patients with a non-ED follow-up after the GPC visit claimed on average more (€110 per patient) than those without a follow-up (€81 per patient) and those with triage and advice only (€29 per patient). The average costs of the 55 patients subsequently referred to the ED were €684 per patient (Table 1). These rates include the initial GPC consultation and possible follow-up at the hospital. (Figure 1)

Table 1. Costs of self-referrals triaged and treated by the GPC

Description	Number (%)	Total costs (€)	Average costs per patient (€)
All self-referrals triaged by the GPC	248 (100%)	€53.850	€217
Self-referrals triaged + treated by the GPC only	193 (78%)	€16.232	€84
Triage and advice only	26 (14%)	€744	€29
GPC consultation	167 (68%)	€15.364	€92
<i>One GPC consultation</i>	101 (52%)	€8.204	€81
<i>GPC consultation with GP follow-up</i>	66 (34%)	€7.285	€110
Self-referrals later on referred to the ED*	55 (22%)	€ 37.618	€684

* after GPC triage or consultation at an ECAP (including GPC costs)



* Due to incomplete files or subsequent GPC visits.

Figure 1. Patient flows and average costs per patient including follow-up

Discussion

Main findings

Our study shows the patient flows and actual costs of self-referrals redirected to the GPC instead of the ED. The vast majority (78%) of these patients could be treated by the GPC at an average of €84 per patient (mostly low-complex care). The average costs for patients referred to the ED after GPC (22%) consultation were €684 (mostly high-complex care).

Comparison with literature

GPC referrals: Earlier studies have shown that triage and treatment of self-referrals by the GP at an ECAP in the Netherlands cause a reduction in ED attendance.(4-5) The patient characteristics and referral rate for self-referrals at the GPC of 22% in our study is in correspondence with other publications (17%-25%). (4-5, 11).

Costs of self-referrals: In the following section we compare the findings of our study with the estimated costs for self-referrals in the Netherlands as described in literature. (table 2) We start with describing the costs of self-referrals presenting at the ED, in which we distinguish low-complex and high complex care (**A**). We continue with a description of the costs of self-referrals presenting at the GPC, in which we distinguish non-referred and referred patients (**B**). At last we finish with a cost-analysis and calculate a possible cost reduction realised by redirecting self-referrals from the ED to the GPC (**C**).

Table 2. Overview of previous published data on (estimated) costs for self-referrals presenting at the ED or GPC

Care localisation	Patient group	Average costs per patient (€)	Source
ED (A)	All self-referrals at ED	unknown	-
	Low-complex care at ED (could have been treated by GPC)	228*	NZA (12) Giesbers et al. (6)
	High complex care at ED (must be treated at ED)	1791*	NZA (12)
GPC (B)	All self-referrals at GPC	217	This paper
	Self-referrals triaged and treated by the GPC	84	This paper
		103-107*	Bosch et al. (11)
		92*	Giesbers et al. (6)**
Self-referrals, later on referred by GPC to ED	684	This paper	

* Based on estimations

A: Costs of self-referrals presenting at the ED: The Dutch Health Authority recently published an analysis of care provided at the ED, in which they made a distinction in low- and high-complex care patients.(11) The low-complex patients at the ED could according to their analysis be treated by a GP or GPC (29.7%) and the high complex care group should be treated at the ED (70,3%). The low-complex patients at the ED claimed on average €228, compared to €1,797 in the high-complex care category.

In 2011 our research group examined the records of self-referrals who presented at the ED. They judged that 80% of those could have been treated by a GPC (low-complex care). (6) The costs reimbursed by the health insurance companies for this low-complex care at

the ED were on average €257 per patient (please note **B** for comparisons of costs for the low-complex care group). In our study, the referred patients (emergency department care needed) claimed €684 compared to €1,797 in the high-complex care group. The referred group in our study consists mostly of low-urgent trauma-related complaints, sent to the ED to rule out fractures.(6) Only half of this patient group has a fracture needing high-complex ED care, which is the assumable explanation for the differences in claimed costs.(4, 13) The high-complex care category of the Dutch Healthcare Authority differs from the patients in our study, since they often include other urgent conditions like acute cardiopulmonary disease and neurology, not frequently seen in our study (<5%).

B: Costs of self-referrals presenting at the GPC: To our knowledge this is the first study to describe the actual costs for self-referrals treated by the GPC, with an average of €217 per patient. The majority (78%) could be treated by the GPC without referring to the ED at the average costs of €84 per patient. The remainder (22%) was later on referred to the ED (high-complex care needed) at the average costs of €684 (please note **A** for comparisons of costs for the high-complex care group).

Two Dutch studies estimated the costs for self-referrals treated by the GPC without referral to the ED, and came to an average of €92- 107 per patient, compared to €84 in our study. (6, 11) This difference could be explained by the fact that 14% of the patients treated by the GPC in our study were only triaged and got advice, mostly because of the low-urgency character of the complaints. The rates for those contacts are lower (€29) than those of a consultation at the GPC (€81-€110). If these patients were excluded, the average costs were €93, which is comparable with these previous estimations.(4)

C: Cost analyses: In this section we compare the costs for self-referrals in the most frequently applied organisation (treatment of self-referrals by ED) with our novel organisation (redirecting all self-referrals to the GPC from ED).

In 2015 approximately 490.000 self-referrals presented at the Dutch EDs, which have an attendance of approximately 2 million patients a year (25%).(12) Our study shows that the GPC is able to treat 78% of these self-referrals with actual costs of €84 per patient. The later on referred patients (22%) claimed €684, including the GPC consultation, ED visit and possible follow-up. The estimated rates for low-complex self-referral at the ED (could be treated by GPC,) were €257.(6) For the calculation of costs of self-referrals needing specialist care we used the claimed amount for referred patients in our study, deducted with the GPC fees included (€684 – €84 = €600). Based on these figures, our research and the studies above, the potential savings in health care costs was calculated if all Dutch self-referrals now presenting at the ED would be redirected to primary care.

The total costs for the treatment of all self-referrals by the ED were calculated at €163 million a year. The total costs for initial treatment of all self-referrals by the GPC (including

follow-up) were calculated at €106 million a year. A potential saving of €56 million a year could be realised by redirecting self-referred patients from the ED to primary care. This amount is considerable conserving the yearly GPC budget of €322 million.

Strengths and weaknesses

In our study we demonstrate the actual patient flows and claimed costs for self-referrals triaged and treated at the GPC of an ECAP. This study is not based on estimations. Due to its design, with a three month follow-up period in general practice, we were also able to also include possible follow-up contacts, making a realistic impression. For the cost analysis (C), the best available data were used to make reliable comparisons. Bias due to exclusion of incomplete files is not assumable. The results presented in our study are based on the claimed costs in one region in the eastern part of the Netherlands and may vary with other regions and countries. There are no former studies presenting actual costs, so our data are at least indicative.

Furthermore, a third of the self-referrals at the ED present during office hours, when the GPC is closed and care is provided by the own GP. (14) In our estimated cost reduction, we used the average rate for self-referrals at the GPC, which is nine times higher than the costs at the GP during office hours (€84 resp. €9). Hence, the estimated cost reduction is probably an underestimation.

Implications for practice and further research

The claimed costs per patient are lower at the GPC compared to the ED, which makes this organisation beneficial in reducing health care costs. Patients also benefit, since primary care is fully reimbursed by the health insurance companies. In the Netherlands, adult patients have to make an annual deductible (raising from €220 in 2012 to €385 in 2019) for diagnostics and hospital care. GP and GPC care is fully covered, without a co-payment. In the Netherlands 56% of the GPCs are currently collaborating with EDs at an ECAP.(4) Most GPCs are closed during office hours, and patients seeking (low-complex) emergency care must contact their general practitioner. As earlier noted, a third of the self-referrals at the ED present during office hours (14). Redirection to primary care is not common practice during these hours and consequently these self-referrals will be treated in secondary care. In urban regions, which have the highest rates of self-referrals at the ED, a continuous opening of the GPC could be of aid to further reduce the self-referral rate at the ED. Redirecting patients with low-complex problems to general practice after ED triage is an interesting alternative. Pilots and further research on this topic is advisable.

During office hours the GP has access to hospitals diagnostics like radiology, while during out-of-hours the patient has to be referred to the ED if a fracture is suspected.(11) Of the self-referrals at the GPC, a quarter is referred to the ED, mostly to rule out fractures.(6) Fifty percent of these patients do not have radiological abnormalities and could be treated in primary care (low-complex care). (11) By giving the GPC at an ECAP access to radiology during out-of-hours a further reduction in referral rates and costs could be realised.

Conclusions

Our study shows the actual costs of self-referrals triaged and treated by the GPC at an ECAP, with an average of €84 per non referred patient (78%) and €684 per patient if referred to the ED (22%). Compared to other sources (4,10) the care for low-complex self-referrals at the ED is three times more expensive compared to the costs we revealed for the GPC. Considerable savings could be realised by redirecting self-referrals from the ED to primary care.

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5

Effects of access to radiology in out-of-hours primary care in the Netherlands: a prospective observational study

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Abstract

Background: In the Netherlands, out-of-hours primary care is provided in general-practitioner cooperatives (GPCs). These are increasingly located on site with emergency departments (ED), forming Emergency-Care-Access-Points (ECAP). A more efficient and economical organisation of out-of-hours primary emergency care could be realised by increased collaboration at an ECAP. In this study, we compared the effects of different models with respect to access to (hospital) radiology by the GPC. We investigated patient and care characteristics, indication for diagnostics and outcomes at GPCs with and without access to radiology.

Methods: A prospective observational record review study of patients referred for conventional radiology for trauma by one of five GPCs in the period April 2014—October 2015, covering three organisational models.

Results: The mean age was 31 years and 56% was female. Extremities were predominately involved (91%). There was a medical indication for radiology in 85% and the assessed risk by requesting GPs on abnormalities was high in 66%. There was a significant difference in outcomes between models. Radiological abnormalities (fractures/luxations) were present in 51% without direct access and in 35% with partial and unlimited access. Overall, 61% of the included patients were referred to the ED; 100% in the models without access and 38% in the models with (partial) access.

Conclusions: GPC access to radiology is beneficial for patients and professionals. The diagnostics were adequately used. With access to radiology, unnecessary referrals and specialist care are prevented. This may lead to a decrease in ED attendance and overcrowding.

Background

The Netherlands has a strong primary care system. Dutch inhabitants are registered at a general practitioner (GP), acting as a gatekeeper to hospital care. The general practice, in which the GP works is accessible on weekdays from 8 a.m. till 5 p.m. Out-of-hours primary care is provided in General Practitioner Cooperatives (GPCs).(1) These are increasingly located on site of the accident and emergency departments (ED) of hospitals, forming a collaborative Emergency-Care-Access-Point (ECAP).(2) The aim of this out-of-hours cooperation is to provide (cost)efficient, patient-centred and safe emergency care. It helps to avoid unnecessary ED attendance. An example of such collaboration is the triage and treatment of self-referrals by the GPC instead of the ED.(3) An opportunity for further cooperation is access to hospital diagnostics like radiology for GPs working in GPCs, which could reduce the number of patients referred to the ED.

Patients frequently consult the GP with musculoskeletal trauma, in which case conventional radiology could be used to rule out a fracture.(5) During *office-hours* the GP has access to hospitals radiology facilities. If an abnormality is ruled out, the patient can be treated by the GP, otherwise the patient is referred to the ED. However, during *out-of-hours*, most GPCs do not have this access to conventional radiology facilities, and all patients need therefore to be referred to the ED.(5) The restrained access to hospital diagnostics causes unnecessary duplication of clinical examinations, a longer length of stay (LOS) and a higher contribution from the obligatory annual deductible of the patient. (6) This system is, therefore, less efficient, not patient centred and probably not cost-effective. Additionally, it generates unnecessary attendance to the ED, that is already struggling with overcrowding. (7-9) Different sources show that the main reason for patients to attend an ED is the expected need for diagnostics (often radiology).(10-12) Consequently, to strengthen their role as a gatekeeper, most Dutch GPs wish to have access to such diagnostics when working at the out-of-hours GPC.

The effects of radiology access by the GPC on the provided care and patient flows are not known. In several regions in the Netherlands, the GPCs have recently gained direct access to the radiology facilities of the hospital without a referral. The objective of our study is to examine the effect of radiology access by the GPC on the provided care and patient flows. We investigated and compared patient- and care characteristics, indication for diagnostics and patient outcomes at GPCs with unlimited access, partial access and without direct access to radiology. This study could be relevant for decision makers and practitioners in other countries searching for optimization of the organisation of out-of-hours primary care and aiming at the reduction of emergency department crowding.

Methods

Design and population

We carried out a prospective observational record review study among all patients referred for conventional radiology for trauma by one of five GPCs in the period April 2014–October 2015, covering three organisational models: unlimited access, partial access and without direct access (Table 1).

Table 1. Models of access of General Practitioner Cooperatives to radiology (N=5), period of inclusion and background information.

Access to Radiology	Period	Background information	
None	A	April - July 2014	ECAP in the Eastern part of the Netherlands. No access to conventional radiology by the GPC. Referral to the ED necessary.
	B	October-December 2014	ECAP in the South-Eastern part of the Netherlands. No access to conventional radiology by the GPC. Referral to the ED necessary.
Limited	C	December 2014 – April 2015	ECAP in the South-West of the Netherlands. GPC access to conventional radiology during weekends and public holidays only, possibilities between 11:00 – 12:00 and 17:00-18:00. Analysis under responsibility of the hospital radiologist. Outside these hours referral to the ED for conventional radiology is necessary.
	D	May – June 2015	GPC on the premises of the hospital, no ECAP. Located in the West of the Netherlands. GPC access to conventional radiology on weekdays between 17:00-20:00 and during weekends and public holidays between 10:00 – 20:00. Analysis under responsibility of the hospital radiologist. Outside these hours referral to the ED for conventional radiology is necessary.
	A'	June - September 2015	ECAP in the Eastern part of the Netherlands. GPC access to conventional radiology on weekdays and during weekends and public holidays, with nightly exclusion. Analysis under responsibility of the radiologist in an associated hospital elsewhere. Outside these hours referral to the ED for conventional radiology is necessary.
Unlimited	E	July - October 2015	ECAP in the Eastern part of the Netherlands. Unlimited access by the GPC during their opening hours. Analysis under responsibility of the hospital radiologist.

Note: ECAP A and A' are the same organisation.

Data collection

Patients were included by the GP on call at the GPC. Routine data from the medical records of the GPC and hospital were analysed by the researchers (anamnesis, examination, evaluation, further policy). In addition, the GP documented for each patient their assessment of the risk of radiological abnormalities (low, high) and indication (medical, wish of patient, both) in the patients record. The GP was requested to make the risk assessment before referral, based on anamnesis and physical examination. Patients with an incomplete or unsigned informed consent form were excluded.

Ethics and privacy

The Ethical Research Committee of the Radboud University Medical Center Nijmegen was consulted and concluded that this study does not fall within the remit of the Dutch Medical Research Involving Human Subjects Act (Wet Mensgebonden Onderzoek). All patients signed an informed consent form allowing the researchers to analyse their medical records. To guarantee privacy, all researchers signed a declaration of confidentiality. The data were anonymized before analysis.

Statistical analyses

SPSS 22 (Statistical Package for Social Sciences) was used for data analyses. Study results are described using descriptive statistics and frequency tables. Indication and assessment, outcomes, referrals to the ED and treatment at the ED for the three models were compared using *t*-tests and chi-square tests.

Results

Patient characteristics

We included 657 patients within three organisational varieties with respect to radiology accessibility by the GPC; 232 patients (35.3%) in a model without access (GPCs A and B), 307 patients (46.7%) in a model with limited access (GPCs C + D + A') and 118 (18.0%) in a model with unlimited access (GPC E). One GPC changed its policy during the study period and contributes therefore to 'without access' (A) and 'limited access' (A'). All included patients received radiological examinations ($n = 657$), regardless of the organisational model.

Table 2 shows the overall patient characteristics. The mean age was 31.3 years and 55.5% was female. Most patients were injured at home (28.8%) or during sports (27.0%). Extremities were predominately involved (91.0%). About 75% concerned a trauma of the distal extremities (hand, wrist, foot, ankle). The population was the same within the three organisation models with respect to age, gender, injury location and affected body part.

Table 2. Patient characteristics of the total sample

	%/(N)
Gender	N=656
Male	44.5 (291)
Female	55.5 (363)
Average age in years (min-max) \pm SD (N=657)	31.34 (1-95) \pm 22.16
Age categories in years	N=649
0-4	4.3 (28)
5-16	30.2 (196)
17-30	22.2 (144)
31-45	16.0 (104)
46-65	18.5 (120)
>65	8.8 (57)
Injury location	N=653
Home	28.8 (188)
Sports	27.0 (176)
Traffic	14.5 (95)
Work	5.1 (33)
School	3.2 (21)
Other	21.4 (140)
Affected body part	N=650
Wrist	21.0 (137)
Foot/toes	20.2 (132)
Hand/fingers	19.4(127)
Ankle	14.6 (95)
Elbow / lower arm	8.1 (53)
Shoulder / clavicle	6.6 (43)
Knee / lower leg	5.5 (36)
Other	4.1(27)

Indication and assessment of the professional

The radiological examination was requested for 84.5% on a strict medical indication, in 4.3% on demand of the patient and in 11.2% for both reasons (Table 3). The GP assessed the risk of radiological abnormalities in 65.7% as 'high'. There were no significant differences in indications or risk assessments between the three organisational varieties.

Outcomes diagnosis

In total 40.2% of the included patients were diagnosed having a fracture or luxation ($N = 263$) (Table 3). There was a significant difference in outcomes between the model without access and the models with (limited) access. The percentage of radiological abnormalities

(fractures and luxations) was 51.3% in the model without access to radiology, 34.6% in the model with limited access and 34.7% in the model with unlimited access.

Table 3. Indication, assessment and diagnosis per organisational model

	No Access	Limited Access	Unlimited Access	Total % (N)
Indication	N=227	N=306	N=118	N=651
Medical	81.5 (185)	85.6 (262)	87.3 (103)	84.5 (550)
Patient demand	4.4 (10)	3.9 (12)	5.1 (6)	4.3 (28)
Both	14.1 (32)	10.5 (32)	7.6 (9)	11.2 (73)
Risk of radiological abnormalities	N=223	N=304	N=118	N=645
Low	31.8 (71)	31.9 (97)	44.9 (53)	34.3 (221)
High	68.2 (152)	68.1 (207)	55.1 (65)	65.7 (424)
Diagnosis*	N=226	N=307	N=118	N=651
Fracture	46.9 (106)	33.6 (103)	33.9 (40)	38.2 (249)
Luxation	4.4 (10)	1.0 (3)	0.8 (1)	2.2 (14)
Distortion of contusion	45.6 (103)	64.5 (198)	65.3 (77)	58.1 (378)
Other	3.1 (7)	1.0 (3)	0.0 (0)	1.5 (10)

* p < 0.05

Assessment, indication and diagnosis

When the risk assessment by the GP was 'high', there were more fractures/luxations (48.8%) compared to a low-risk assessment (24.4%). Of all fractures and luxations, 79.6% was requested with a high-risk assessment and 87.7% on a strict medical indication. Nine of the 28 patients where radiology was only requested on demand of the patient showed a fracture (32.1%) (Table 4).

Table 4. Indications, assessment and location for fractures/luxations versus other diagnosis

	Fracture / luxation % (N)	Other % (N)	Total % (N)
Indication	N=260	N=391	N=651
• Medical	41.5 (228)	58.5 (322)	100 (550)
• Patient demand	32.1 (9)	67.9 (19)	100 (28)
• Both	31.5 (23)	68.5 (50)	100 (73)
Assessment risk on radiological abnormalities*	N=263	N=384	N=645
• Low	24.4 (54)	75.6 (167)	100 (221)
• High	48.8 (207)	51.2 (217)	100 (424)
Affected body part	N=263	N=390	N= 653
• Wrist	52.6 (72)	47.4 (65)	100 (137)
• Hand/fingers	47.2 (60)	52.8 (67)	100 (127)
• Feet/toes	23.5 (31)	76.5 (101)	100 (132)
• Ankle	23.2 (22)	76.8 (73)	100 (95)
• Elbow / lower arm	54.7 (29)	45.3 (24)	100 (53)
• Shoulder/Clavicle	53.5 (23)	46.5 (20)	100 (43)
• Knee/lower leg	38.5 (15)	61.5 (24)	100 (39)
• Upper arm	56.6 (5)	44.4 (4)	100 (9)
• Hip	25.0(2)	75.0 (6)	100 (8)
• Spine	25.0 (1)	75.0 (3)	100 (4)
• Upper leg	66.7 (2)	33.3 (1)	100 (3)
• Pelvis	100 (1)	0.0(0)	100 (1)
• Facial bones	0.0 (0)	100 (1)	100 (1)
• Thorax	0.0 (0)	100 (1)	100 (1)

* p < 0.05

Emergency department: referrals, diagnosis, treatment and follow-up

Of all patients, 60.5% was referred to the emergency department. Logically the referral rate for GPC without access to radiology was 100% (N = 226). This was only 38.4% (N = 118) in case of limited access and 39.8% (N = 47) in case of unlimited access (Table 5) (difference statistically significant). Models with limited access to radiology (89.8%) and unlimited access (87.2%) had a statistically significant higher percentage of radiological abnormalities (fractures and luxations) compared to those without (51.3%). Treatment at the ED consisted most often of gypsum in all three models (43.8%); in the model without GP access to radiology bandage/taping was more frequent as compared to the models with (limited) access. There were less follow-up treatments or visits planned at the hospital in the model without access (63.8%) compared to 90.4% and 93.0% in

Table 5. Care at the Emergency Department per organisational model

	No Access % (N)	Limited Access % (N)	Unlimited Access % (N)	Total % (N)
Referral to ED*	N=226 100 (226)	N= 307 38.4 (118)	N=119 39.4 (47)	N= 646 60.5 (391)
Diagnosis at ED*	N=226	N=118	N=47	N=391
Fracture	46.9 (106)	87.3 (103)	85.1 (40)	63.7 (249)
Distorsion or contusion	45.6 (103)	7.7 (9)	13.8 (6)	30.2 (118)
Luxation percentage	4.4 (10)	2.5 (3)	2.1 (1)	3.6 (14)
Other	3.1 (7)	2.5 (3)	0.0 (0)	2.5(10)
Treatment at ED	N=266	N=111	N=42	N=379
Gypsum	34.1 (77)	60.4 (67)	71.4 (30)	43.8 (174)
Bandage/tape	29.6 (67)	14.4 (16)	4.8 (2)	22.4 (85)
None / advice	16.8 (38)	4.5 (5)	2.4 (1)	11.6 (44)
Sling	7.4 (16)	8.1 (9)	14.3 (6)	8.2 (31)
Other	8.8 (20)	9.9 (11)	0.0 (0)	8.2 (31)
Operation	3.5 (8)	2.7 (3)	7.1 (3)	3.7 (14)
Follow-up	N=240	N=104	N=43	N=371
ED	100 (224)	38 (104)	39.8 (43)	60.5 (371)
Hospital	63.8 (143)	90.4 (94)	93.0 (40)	74.7 (227)
None	20.1 (45)	6.7 (7)	4.7 (2)	14.6 (54)
Own GP (if needed)	16.1 (36)	2.9 (3)	2.3 (1)	10.8 (40)

* p < 0.05

the models with (limited) access. Patients were more often referred back to the GP in the general practice at which they were registered in the model without access (16.1%) (Table 5).

Discussion

Main findings

Our work shows that regardless of the model, patients referred by the GPC for radiology are mostly young of age, female and have injuries of their distal extremities. In general, the GPC professional demanded radio-diagnostics on a medical indication (85%) and estimated a high probability on abnormalities (66%). With an overall average of 40% on radiological abnormalities, there is an appropriate diagnostic outcome. The no direct access model in our study had a significantly higher percentage of radiological abnormalities (51%) compared with the novel organisations (35%–40%), but showed no differences in indications or assessment. With GPC access to radiology referral rate was only 40% (compared with 100% in the standard model).

Comparison with literature

A recent review of the effectiveness of primary care services located with the ED illustrates that ED physicians ordered more X-rays than GPs in the ED or adjacent services.(9) GPs seem to use the resources accurately and in a restrained matter. Nevertheless, concerns were addressed about a possible increase in the use of diagnostics if at direct disposal of GPs working at the GPC.

A recent published Dutch study on referrals from the GP to ED described a fracture percentage of 41% (no GP access to radiology).(13) With an average of 40% radiological abnormalities in our study, there is an appropriate diagnostic outcome. The no direct access model in our study had a significantly higher percentage of radiological abnormalities compared with the novel organisations, but showed no differences in indications or assessment. We hypothesize that GPs experience a barrier to refer patients directly to the ED, probably to prevent unnecessary crowding of the ED, an increase in costs and longer length of stay for the patients. The fact that the risk assessments and indications are comparable between the models, contradicts the belief that GPs tend to misuse the diagnostics if they are at their direct disposal. Nevertheless, they should remain aware on the risk of performing unnecessary diagnostics.

The number of referrals is significantly higher in the model without direct access (100%), compared to models with (limited) direct access (approximately 40%). With GPC access to radiology, there is a decrease in referrals to the ED with an expected concomitant cost reduction. It will diminish the amount of unnecessary ED consultations, which could contribute to reduce ED overcrowding.(7, 8, 14) The outcomes and resulting treatment at the ED differ between the models. In the model without access to radiology, there are significantly more patients with contusions/dislocations and less with fractures compared to the novel models. As a result, there is a diversity in the most applied treatment at the

ED. In the model without direct access there is more plastering and bandaging, whereas the EDs related to GPCs with (limited) direct access apply more gypsum. The treatment at the ED reflects the referred patient population and hence tends to be more specialist in the models with (limited) access, due to GP selection. This also clarifies the higher follow-up at hospitals in the models with access to radiology.(6)

Strengths and weaknesses

To our knowledge, there are no other multicenter studies on indications or risk assessment before radiology by the GPC. In addition, this prospective observational study gains insight into patient flows in the various models with respect to GPC access to radiology. Of the 121 GPCs in the Netherlands, 68 (56%) are situated in an ECAP and 20 (17%) have access to conventional radiology. Six of those have unlimited access and 14 limited access.(15) In our study, we analysed the effect of radiology in patient flows for six GPCs at an ECAP, of which two without access, three with limited access and one with unrestrained access. Unfortunately, due to limited financial resources, an intervention study could not be committed, and the number of included GPCs was limited.

Patients were identified and included by GPs. Although we intended to include all, it is conceivable that there has been a selection of patients. Possibly, patients with an evident fracture were not included in the registries of the GPC and directly referred to the ED. In addition, it is imaginable that during busy hours patients with minor trauma were not included. It is not known in which direction the results are influenced. In our study, only one GPC with unlimited access to radiology was included, which might not be representative of other regions.

Implications for practice and further research

This study indicates that access to radiology by the GPC at an ECAP has obvious benefits for patients and professionals. This novel manner of the organisation should, therefore, be considered by health care workers, managers and policy makers. However, the effects on patient satisfaction and LOS are not yet certain and should be a subject of further studies. It is expected that the mean LOS for the patient will decrease by giving GPCs access to diagnostics, especially since patients without a radiological abnormality do not have to be treated at the ED. Placement of a GP for treating low-acuity patients at the ED has already shown to reduce LOS.(16-17) Patients referred to the ED by the radiology department have a shorter LOS compared with the average ED population.(18) Longer LOS has shown a negative effect on patient satisfaction. (19, 20) Hence, reduction of LOS by giving GPCs access to radiology is expected to contribute to patient-centred care. Further research is advisable to evaluate the effects on LOS and patient satisfaction.

Care for self-referrals provided by the GPC is estimated to be more than three times cheaper compared to the care for self-referrals at the ED.(3) Giving GPCs access to radiology will

probably cause a cost reduction, caused by the decline in referral rates (60%) and follow-up. Furthermore, a lower contribution to the annual deductible of the patient is expected. However, actual financial figures are lacking and should be topic for further research. Although our data and previous studies demonstrate that GPs working at emergency care settings are restrictive with the use of diagnostics, unnecessary X-rays must be prevented. We recommend to develop educational programs for GPs (in training) and further research on this topic.

Conclusion

Access to radiology by the GPC at an ECAP has benefits for patients and professionals. The GPC utilizes the option for access adequately, mostly with a strict medical indication and high-risk assessment. It enables professionals at the GPC to execute their role as gatekeeper more adequately. With direct access to radiology, more patients maintain under treatment of the GP, and unnecessary referrals and specialist care is prevented. This will probably lead to a decrease in ED attendance. A reduction in costs and LOS and an increased patient maintain under treatment of the GP, and unnecessary referrals and specialist care is prevented. This will probably lead to a decrease in ED attendance. A reduction in costs and LOS and an increased patient satisfaction is expected, but should be analysed in further studies.

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6

The effects of access to radiology in out-of-hours primary care on patient satisfaction and length of stay; a prospective observational study

6

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Abstract

Background: General-practitioner-cooperatives (GPCs) provide out-of-hours primary care in the Netherlands. GPCs are increasingly co-located with emergency departments (ED), forming Emergency-Care-Access-Points (ECAPs) which generate opportunities for further cooperation between emergency care providers. Access to hospital radiology facilities by the GPC is known to decrease the number of ED referrals, but the effects on length of stay (LOS) and patient experiences are unclear. We examined LOS and patients experiences at GPCs and EDs with and without access to radiology.

Methods: A mixed-methods study was conducted. We combined a prospective observational record review study, together with a patient-questionnaire-study, supplemented with LOS-analysis. We included patients referred for conventional radiology for trauma by one of six GPCs in the period April 2014 till October 2015.

Results: The average total length of stay was 98 minutes, with a significant difference between GPCs without (121 minutes) and with (limited) access to radiology (86 and 90 minutes). On a ten-point-scale, patients rated GPC at 8.4 and EDs at 8.1, with a significantly higher rating for GPCs with unlimited access (8.9).

Conclusions: Access to radiology by the GPC, which helps to avoid unnecessary ED attendance, is related to a lower length of stay and is highly appreciated by patients. GPCs with unlimited access provide the most efficient and best valued care, which contributes to more patient-centred care.

Background

The majority of the Dutch inhabitants are registered at a general practice where the general practitioner (GP) works. The Dutch GP acts as a gatekeeper to hospital care and is able to treat over 90% of patients without a referral to the hospital.(1) The GP-practice could be contacted and visited during *office hours* for all health related problems. In *out-of-hours*, primary care is organised by General-Practitioner-Cooperatives (GPCs), which are meant for urgent health care problems only. The GPCs provide (cost)efficient, patient-centred and qualitative emergency care and help to reduce unnecessary attendance at Emergency Departments (ED).(2)

GPCs are increasingly located on site of EDs of hospitals, forming a Emergency-Care-Access-Point (ECAP), which creates possibilities for further inter-professional cooperation. (2-3) An example of this cooperation is the triage and treatment of self-referrals by the GPC instead of the ED.(3) An option for further cooperation is access to hospital diagnostics like radiology for GPs working at GPCs.

The GP(C) is often consulted for musculoskeletal trauma, in which case conventional radiology might be of aid to rule out a fracture or luxation.(4) During *office-hours* the GP has direct access to hospitals radiology facilities. In case of radiological abnormalities the patient will be referred, otherwise further treatment will be offered by the GP. However, during *out-of-hours*, most GPCs do not have access to conventional radiology facilities, and all patients need therefore to be referred to the ED.(5-7) This restrained access to hospital diagnostics causes unnecessary duplication of clinical examinations at the ED, a higher contribution from the obligatory annual deductible of the patient and possibly a longer length of stay (LOS).(8-9) Longer waiting times have been associated with a lower patient satisfaction.(10) The efficiency, cost-effectiveness and patient-centeredness of this system is therefore most likely suboptimal. Additionally, it generates unnecessary attendance to the ED, that is already struggling with overcrowding.(11-13) Different studies illustrate that the main reason for patients to attend an ED is the expected need for diagnostics (often radiology).(14-17)

In several regions in the Netherlands, the GPCs have recently gained direct access to the radiology facilities of the hospital, without the need to refer the patient to the ED.(5) Of the GPCs with access to radiology (about 20% of all 121 Dutch GPCs), most have limited access (in restricted time frames; 70%) and some have unlimited access (30%).(5-6) The positive effects of radiology access by the GPC on the provided care and patient flows have recently been published and a 4.5% reduction of ED referrals has been demonstrated.(6-7) The effects on patient satisfaction and length of stay (LOS) are unknown.

The objective of our study is to examine the effects of different organisational models of radiology access by the GPC on LOS and patient experiences. We compared GPCs with unlimited access, limited access (in restricted time frames) and without direct access to radiology. The study will provide insight into the most efficient and patient-centred organisational model with respect to GPC access to radiology.

Methods

Design and population

We carried out a prospective observational record review study among patients referred by the GPC for conventional radiology with trauma in the period April 2014 - October 2015, in a convenience sample of six GPCs covering three organisational models: unlimited access (N=1), limited access (N=3) and without direct access to radiology (N=2).(5) This was supplemented with a patient questionnaire to assess satisfaction with the provided care and a length of stay analysis.

Data collection

Patients with trauma referred for conventional radiology by the GPC were selected by the GP on call. After GPC consultation and selection, patients were directed to the GPC-desk, where a study number was assigned. Furthermore they received an informed consent form and a patient questionnaire on which a study number was noted. Patients were requested to fill in the forms and return them at the GPC-desk directly after their treatment. The time of issue and return of the questionnaire was listed by the desk-assistant on the questionnaire form. The informed consent form, the (anonymous) patient questionnaire and study number list with patient personal data were stored separately by the GPC-desk assistance. Forms returned outside the GPC opening hours could be dropped in a closed post-box or returned by post addressed to the GPC. Patients with an incomplete or unsigned informed consent form were excluded.

The patient questionnaire measured patients experiences with the provided care and was based on the Consumer Quality Index (CQ-I).(18) Two questions about the experienced cooperation between GPC and ED were added and filled in only by patients referred to the ED. The questionnaire consisted of a total of 21 questions, which could be answered in less than five minutes. Patients were requested to fill in and return the forms at the GPC desk directly after their treatment.

To assess LOS we used the time of start of the appointment at the GPC as registered in the patient record as starting point (A). The questionnaire and informed consent form were handed over to the patient after the GPC consultation (B). The time of return of the questionnaire was used as end point for LOS (C). Questionnaires returned by post or post-box were not used in the LOS-analysis (16%).

Ethics and privacy

We consulted the Ethical Research Committee of the Radboud University Medical Center in Nijmegen which concluded that this study does not fall within the remit of the Dutch Medical Research Involving Human Subjects Act. All patients signed an informed consent form. And all researchers signed a declaration of confidentiality to guarantee privacy. Prior to analysis data were anonymized.

Statistical analyses

For data analyses SPSS 22 (Statistical Package for Social Sciences) was used and study results are described using frequency tables and descriptive statistics. Outcomes, referrals to the ED, LOS and patient experiences for the three models were compared T-tests and Chi-square tests.

Results

Patient characteristics

We included 657 patients within three organisational varieties with respect to accessibility to conventional radiology with trauma by the GPC; 232 patients (35%) in a model without access, 307 patients (47%) in a model with limited access and 118 (18%) in a model with unlimited access. The mean age was 31.3 years and 55.5% was female. Most patients were injured at home (28.8%) or during sports (27.0%) and extremities were predominately involved (91.0%). The population was the same within the three organisational models with respect to age, gender, injury location and affected body part (not in table).

In total 40.2% of the included patients were diagnosed having a fracture or luxation (N=263). The outcomes differed significantly between the models without access and models with (limited) access. The percentage of radiological abnormalities (fractures and luxations) was 51.3% in the model without access to radiology, 34.6% in the model with limited access and 34.7% in the model with unlimited access. The referral rate for GPC without access to radiology was (logically) 100% (N=226), compared to 38.4% (N=118) in case of limited access and 39.8% (N=47) in case of unlimited access (difference statistically significant). (figure 1)

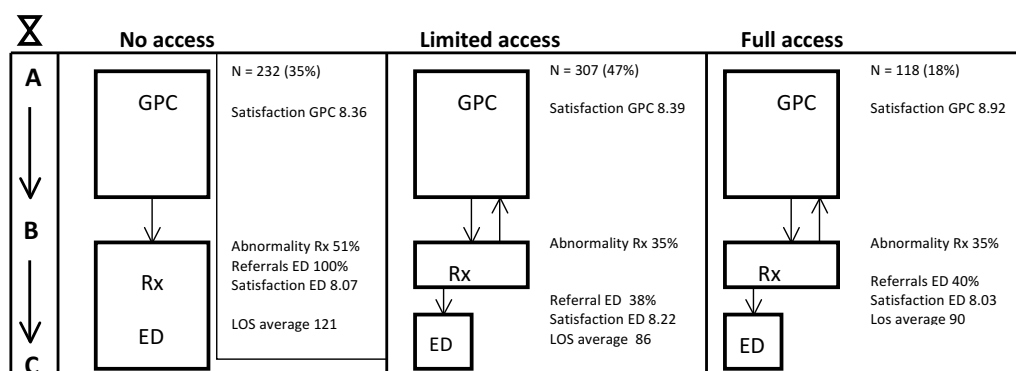


Figure 1: Number of inclusions, abnormalities on Radiological examination (Rx), Referrals to ED, patient satisfaction and average LOS (in minutes) per organisational model with respect to GPC access to radiology. A: appointment time of the patient at the GPC (start point). B: issue of questionnaire and informed consent form to the patient after GPC visit. C: Return of questionnaire and informed consent form (end point).

Length of stay

The average total LOS for all included patients was 98 minutes. (table 1) The average LOS for patients visiting the GPC, radiology and ED was significantly longer compared to those visiting the GPC and radiology department only (120 versus 66 minutes). The LOS in models without direct access (121 minutes) differed significantly from those with limited access (86 minutes) and unlimited access to radiology (90 minutes) ($p < 0.05$).

Table 1. Average length of stay (in minutes) per organisational model with respect to radiology accessibility of the GPC

	No access	Limited access	Unlimited access	Total
Length of stay total				
mean (95% CI)	121 (114-128)	86 (80-91)	90 (79-102)	99 (95-103)
range	32-300	15-245	17-270	15-300
(N)	(N = 191)	(N= 259)	(N= 104)	(N= 554)
Length of stay GPC+ Rx	-			
mean (95% CI)		68 (63-74)	60 (52-69)	67 (62-71)
range		15-235	17-195	15-235
(N)		(N=160)	(N=62)	(N=222)
Length of stay GPC + Rx +ED				
mean (95% CI)	121 (114-128)	114 (104-123)	134 (114-153)	121 (115-126)
range	32-300	25-245	30-270	25-300
(N)	(N=191)	(N=99)	(N=42)	(N=332)

GPC General Practitioner Cooperative. Rx conventional radiology. ED Emergency department.

The patients were asked if the experienced LOS was problematic and if they were informed by the professionals about expected LOS. About half of the total population (47.9%) considered the length of stay as problematic. (table 2) Patients referred to the ED considered the LOS a greater problem (53.2%) compared to those treated by the GPC only (39.6%) ($p < 0.01$).

Table 2 Patients experiences concerning length of stay and information by the professional

	No access % (N)	Limited access % (N)	Unlimited access % (N)	Total % (N)
Length of stay perceived as a problem	52.6 (113)	43.1 (121)	51.4 (57)	47.9 (291)
• Yes	47.4 (102)	56.9 (160)	48.6 (54)	52.1 (316)
• No				
Informed about expected length of stay				
• Yes	34.9 (75)	37.8 (105)	28.2 (31)	35.0 (211)
• No	65.1 (140)	62.2 (173)	71.8 (79)	65.0 (392)

Patient satisfaction

In the questionnaire patients were requested to give a rating on a ten-point scale for the care given at the GPC and ED (only when visited). The mean rating of care at the GPC was 8.42 (N=644). For patients who visited the ED the mean rating of care was 8.11 (N=343). The mean rating of the cooperation between ED and GPC 7.91 (N=240, only ED referred patients). The GPC with unlimited access obtained a significantly higher rating (8.92) than other models (table 3) ($p < 0.05$). We did not find a correlation between LOS and patient satisfaction in our study (data not shown).

Table 3. Patients ratings of and experiences with care at the GPC and ED within the different organisational models with respect to access to radiology by the GPC.

	No access	Limited access	Unlimited access	Total
Rating GPC (0-10)				
mean (95% CI)	8.36 (8.22-8.50)	8.39 (8.27-8.50)	8.62 (8.43-8.81)	8.42 (8.34-8.50)
range	5-10	3-10	6-10	3-10
(N)	(N=228)	(N=301)	(N=115)	(N=644)
Rating ED (0-10)				
mean (95% CI)	8.07 (7.91-8.24)	8.22 (7.94-8.49)	8.03 (7.55-8.51)	8.11 (7.97-8.24)
range	3-10	0-10	2-10	0-10
(N)	(N=212)	(N=96)	(N=35)	(N=343)
Rating cooperation GPC-ED (0-10)				
mean (95% CI)	7.7 (7.37-8.03)	8.02 (7.74-8.30)	8.07 (7.68-8.46)	7.91 (7.72-8.10)
range	0-10	0-10	5-10	0-10
(N)	(N=90)	(N=109)	(N=41)	(N=240)
	% (N)	% (N)	% (N)	% (N)
Patients experiences with GPC professional				
• Taken seriously	100 (230)	96.4 (285)	98.2 (113)	98.0 (651)
• Confidence in expertise	99.2 (226)	97.7 (298)	100(115)	98.6 (650)
• Sufficient time	99.2(226)	97.7(299)	100 (115)	98.6 (649)
Patients experiences with ED professional				
• Taken seriously	89.6 (209)	97.0 (96)	100 (35)	98.3 (346)
• Confidence in expertise	99.1 (210)	97.9 (96)	100 (35)	98.8 (345)
• Sufficient time	95.8 (202)	93.9 (93)	97.1 (34)	95.4 (345)

GPC General Practitioner Cooperative.

ED Emergency department

Most patients indicated that they felt taken seriously by the professionals (GPC 98% and ED 98.3%) and that they had confidence in their medical expertise (GPC 98.6 and ED 98.8). (table 3) According to the patients, professionals at the GPC and ED had sufficient time (GPC 98.6% and ED 95.4%).

Discussion and conclusions

Main findings

Our study shows that access to conventional radiology by the GPC at an ECAP is related to a significantly shorter LOS for the patient. The patients were overall satisfied with the delivered care by the GPC, ED and their cooperation. The GPC with unlimited access to radiology had significantly higher satisfaction ratings compared to those with limited or without access. Patients in our study felt taken seriously and had confidence in the expertise of the professionals working at the GPC and/or ED.

Comparison with literature

Thijssen et al. investigated the LOS of patients at the ED in the Netherlands and found a mean of 130 minutes per ED visit, which is rather low compared to other Western countries (176-480 minutes).⁽⁹⁾ They reported a significant lower mean LOS at the ED of 91 minutes in case of trauma and 71.5 minutes if the patient was sent to the radiology department (GP had (limited) access to conventional radiology).⁽⁹⁾ In our study the average LOS for patients attending the GPC and ED was 120 minutes. This difference in LOS of 29 minutes is understandable, since our study includes the GPC visit (planned at ten minutes), radio diagnostic examination and evaluation (time unknown), ED visit and possible waiting times in between. Our study is first to report a significant reduction in LOS between models without and models with (limited) access to radiology.

The reported satisfaction rates in our study in general resemble those of previous Dutch studies at the GPC and ED.⁽¹⁹⁻²¹⁾ The care at the GPC in our study was well rated, with an average of 8.4 on a ten-point-scale. Van Uden et al. reported an overall satisfaction grade of 80% (scale 0-100%) for GPC consultations in the Netherlands.⁽¹⁹⁾ Smits et al. performed a longitudinal observational study to evaluate GPC patient satisfaction and showed that the mean overall grade for the organisation of the GPC improved over time (from 7.6 in 2003/2004 to 7.8 in 2007/2008 (scale 1-10)) and the provided care more often met the patients expectations (from 86% to 88%).⁽²⁰⁾ Patients attending the ED in our study, rated the received care with 8.1 on a ten-point-scale. A Dutch research group conducted a cross-sectional survey among patients attending nine Dutch EDs and report an overall satisfaction of 84 (scale 0-100).⁽²¹⁾

The strongest predictor of ED patient satisfaction is how satisfied the patient is with interpersonal interactions with ED physicians and nurses.⁽¹⁰⁾ The interpersonal interactions of patients with GPC and ED personnel have not been subject of investigation in this study. However, patients in our study felt taken seriously and had high confidence in the expertise of the professionals. These findings most likely have had positive effects on the relatively

high patient satisfaction ratings reported in our study. Waiting times have also been revealed as important predictors: if these are longer than what patients expect or deems appropriate, than dissatisfaction is likely to arise.(21) We did not find any correlation between LOS and patient satisfaction.

As mentioned before, the mean LOS at the ED in the Netherlands is relatively short compared to other Western countries. Furthermore the LOS for patients with trauma or patients sent from the radiology department are even lower. The relatively short waiting times for patients positively influenced the mean satisfaction rate, despite the fact that almost half of the patients considered the waiting times as problematic (47.9%).

Strengths and weaknesses

To our knowledge, this study is the first to investigate the effects on LOS and patient satisfaction of access to radiology by the GPC at an ECAP. It supplements previous published a study on the effects on referrals.(6) We could not perform an experimental study, but investigated the current situation in a convenience sample of GPCs. Therefore, we were not able to demonstrate causal relationships. Moreover, the number of participating GPCs was rather limited, partly due to limited financial resources, which could have influenced our findings. However, the GPCs in our study varied in size, urbanisation grade and region in the Netherlands, contributing to the representativeness of the study.

The time to fill out the questionnaire (less than five minutes) was included in the LOS, because we used the time of return of the questionnaire as the end point of care. The LOS is therefore somewhat overestimated. This applied to all three models equally, so it has not influenced our comparative analyses. Finally, the total number of selected patients during our study has unfortunately not been recorded, which made it impossible to calculate the response rate. Selection bias could have occurred, hence admitted patients possibly did not return their questionnaires and forms.

Implications for practice and further research

Crowding of emergency departments is a growing problem in many Western countries, leading to an increased LOS.(11-13) Multiple factors have been associated with ED crowding of which non-urgent ED visits are frequently mentioned.(10) Part of these non-urgent visits are caused by self-referrals presenting at the ED rather than in primary care (GP during daytime or GPC in out-of-hours).(8-10) Increasingly GPCs and EDs are cooperating forming an ECAP, giving opportunities to redirect the self-referred patients from ED to GPC.(2) The GPC is able to safely treat 76% of the redirected self-referrals.(2) The referral rate could be further reduced by giving the GPC access to radiology, which is common practice during daytime. GPs with access to radiology use the diagnostics in a restrained matter an cause a reduction in ED referrals.(5-6) A recently published Dutch study shows a reduction in ED

referrals of 4.5% at an ECAP with limited access to radiology.(7) It is assumable that with unlimited access the reduction in GPC referrals will be even higher. In our study, the models with unlimited access have been significantly higher valued compared to the other models. Therefore, unlimited access to radiology by the GPC at an ECAP is advisable to provide efficient and patient centred care and to prevent non-urgent care at the ED which could contribute to reduce ED crowding.

To further strengthen the role of the GPC, other diagnostics like laboratory and ultrasound could also be considered, but should be well implemented with an adequate evaluation. Although a cost reduction is expected, further research on cost-effectiveness is advisable.

Redirection of self-referrals and low-complex care from the ED to primary care settings is advisable and increasingly applied. This helps to reduce crowding at the ED, but on the other hand gives an increased workload in primary care. It is advisable to invest in the primary care setting to keep this redirection sustainable.

Conclusions

This study shows that access to conventional radiology by the GPC is related to a lower average LOS and is better valued by patients. The access to radiology by the GPC contributes to more efficient and patient-centred care. Moreover, it may help to avoid unnecessary ED attendance and strengthens primary care.

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7

General discussion

The aim of this thesis was to analyse the effects of the collaboration between the general-practitioner-cooperative (GPC) and emergency department (ED) at an emergency-care-access-point (ECAP) in the Netherlands. In this final chapter, we present and interpret the main findings and give recommendations for further research and development.

Summary of main findings

The organisation, performance and developments of out-of-hours primary care

In **chapter 2** we performed a narrative review on the organisation, performance and developments of out-of-hours primary care in the Netherlands. During out-of-hours, access to primary care is organised in nationwide, uniform, large scaled GPCs, which are meant for urgent health care problems. The number of contacts with the GPC increased over the years to 245 per 1000 citizens per year (in 2015). Many contacts (45%) were triaged as non-urgent (from a medical point of view), despite the aim of the cooperatives. The most prominent development in out-of-hours primary care is the increased cooperation of GPC and ED at an ECAP, which provides opportunities to redirect ED self-referrals to primary care. Direct GPC access to diagnostic facilities of the hospital may further optimize efficiency. Other important new developments include task substitution from physicians to nurses and the launch of a two-year training program for GPs to become experts in emergency care (started in 2015).

Self-referrals triaged and treated by the out-of-hours general practitioner cooperative

In **chapter 3** we studied patient and care characteristics of self-referrals triaged and treated by the out of hours GPC at an ECAP in the Netherlands. A three-month follow-up was included to assess efficiency and safety. Self-referred patients at an ECAP are more often male (59%), mostly have low-urgent health problems (95%), and frequently have trauma related complaints (59%). The majority of patients were treated by the GPC, without referral to the ED (76%). When the patient was referred to the ED (24%), this was according to common medical practice (98%). Most patients were referred for conventional radiology to rule out fractures (53%). Thirty percent had a follow-up contact, mostly with their own GP and rarely with the ED. Complications (non-severe) were registered in 3.2%, of which 0.4% were potentially preventable.

In **chapter 4** we performed an additional patient flow study and cost analysis of self-referrals triaged and treated by one GPC in the East of the Netherlands. Self-referrals at the GPC claimed €217 on average. The actual claimed costs per patient for self-referrals treated by the GPC only (78%) were on average €84,- (including follow-up). The actual claimed costs for patients subsequently referred to the ED (22%), were on average €654,- (including GPC-

rates and follow-up). Compared with available literature our figures illustrate that the care for low-complex patients at the GPC is three times cheaper than care for those patients at the ED.

General practitioner cooperative access to radiology at emergency care access points

A further reduction in referrals to the ED could be realised by giving the GPC at an ECAP direct access to hospital diagnostics, like radiology. In **chapter 5** we investigated patient characteristics, indications for diagnostics and outcomes at GPCs at an ECAP with- and without access to radiology. Extremities were predominately involved (91%) and mostly there was a medical indication for the radiological examination (85%). There was a significant difference in outcomes between models; Radiological abnormalities (fractures/luxations) were present in 51% *without* direct access and in 35% *with direct access* to radiology. In the models without access to radiology, 100% was referred to the ED, and in the models with access 38%. Access to radiology by the GPC reduces unnecessary ED referrals and specialist care. This may lead to a cost reduction, shortening of length of stay of the patient, increased patient satisfaction and decreased ED crowding.

In **chapter 6** we analysed the effects of GPC access to radiology at an ECAP on length of stay (LOS) and patient satisfaction. The average LOS was 98 minutes, with a significant difference between GPCs without (121 minutes) and with (limited) access to radiology (86 and 90 minutes). On a ten-point-scale, patients rated the GPC at 8.4 and ED at 8.1, with a significantly higher rating for GPCs with unlimited access.

Strengths and weaknesses

Many Western countries are struggling with emergency care overcrowding, shortages in personnel, finances, capacity and a change in demand of patients. An ECAP might offer solutions for these problems, hence further scientific insight in the effects this novel organisation as provided in this thesis is of great relevance. Due to the specific Dutch organisation of emergency care and primary care, the results of this thesis could possibly not be applied to other countries, however, it can be seen as an inspiring example. We did not perform an experimental study, but investigated the current situation in a convenience sample of GPCs. Therefore, we were not able to demonstrate causal relationships. Moreover, the number of participating GPCs was rather limited, partly due to limited financial resources, which could have influenced our findings and generalisability. We analysed the costs for self-referrals triaged and treated at only one GPC in the Netherlands, which was made possible with the support and transparency of the involved insurance company. Unfortunately, access to financial data is not customary and as a consequence, we were not able to perform a study at multiple centres. With the respect to the studies concerning the access to radiology by the GPC, we were not able to retrieve the percentage

of missed fractures by the GPC, mainly caused by differences in electronic patient record systems between the GPC and GP-practice. The studies in this thesis were based on data from 2012 till 2016. Over the last years, there have been several relevant developments and our studies may therefore not sufficiently represent the current situation in out-of-hours primary care in the Netherlands.

Interpretation of findings

The latest most important developments in the organisation and collaboration between general practitioner cooperatives and emergency departments at emergency care access points in the Netherlands

In this thesis we presented the increased cooperation between GPCs and EDs at an ECAP as the most prominent development in out-of-hours primary care in the Netherlands anno 2016. Over the past years the collaboration between GPCs and EDs at an ECAP has indeed increased as expected. At the moment (in 2018), the Netherlands has 121 GPCs (119 in 2015) of which 63% (56% in 2015) is located on site of a hospital with an ED.(1, 2) Recent studies show that of the 94 EDs in the Netherlands, the majority (69%) have a GPC in the vicinity of the hospital and a minority (42%) have a further collaboration and co-location with the GPC in an ECAP.(2,3) The number EDs with an ECAP has increased with 45% over the last four years.(2,3) These ECAPs provide opportunities for increased collaboration, of which the redirection of self-referrals and GPC access to radiology are further analysed in this thesis.

Self-referrals are patients who consult the ED of a hospital at their own initiative, without consulting the GP first. Earlier studies show that self-referrals are mostly men, young of age, and have trauma related complaints.(4-5) The main motives for visiting the ED instead of the GP are the easy accessibility and health concerns of the patient.(6,7) Self-referrals at the ED claim expensive specialist care and cause unnecessary attendance and longer waiting times.(8-9) Dutch studies indicate that 17% of all ED consultations were self-referred patients, with a range of 3 to 58%.(2, 3) It is estimated that 51-80% of these ED self-referrals could be treated by primary care.(4, 10-12)

This thesis demonstrates the actual portion of self-referrals that were treated by the GPC at an ECAP and show that 76% of the self-referrals presenting at an ECAP were treated by the GPC in a safe and (cost)efficient manner. The patients characteristics of self-referrals at the ECAP treated by the GPC resemble those of the self-referrals presenting at the ED.(4, 6) This thesis shows that the claimed costs of low-complex self-referrals treated at the GPC are three times lower than those treated at the ED, which is in correspondence with previous estimations(8). We expect that a considerable cost reduction could be realised by redirecting all self-referrals from the ED to primary care.(13)

Access to hospital radiology diagnostics by the GPC: This thesis demonstrates that access to hospital diagnostics at an ECAP provides efficient and patient centred care. A recent Dutch study demonstrates a reduction of 4.5% in ED visits, by giving GPCs limited access to hospital diagnostics.(14) This reduction may be higher in other regions or with unlimited GPC access to radiology. This novel organisation helps to reduce health care costs, increases efficiency, decreases ED visits and generates more patient-centred care. Despite the majority of GPCs are located on site of the hospital (63%), only 27% of those have access to hospital radiology facilities.(15)

The latest most important developments in emergency care in the Netherlands; increased workload: Due to the increased cooperation at an ECAP, redirection of self-referrals and direct GPC access to radiology, an increase in patients at the GPC and a decrease at the ED is expected (this thesis). The narrative review in our thesis indeed described a yearly increase of GPC contacts and was based on best available data in 2015 (16) However, later figures from 2017, show a slight overall decrease (-2%), with a decrease in home visits (-4.4%) and GPC consultations (-4.3%), but an increase in telephone consultations (+1.8%). (1) Contradictory, professionals working at the GPC experience an increased workload. This increase in experienced workload by GPs cannot be explained by an increased number of consultations, but is probably a result of higher complexity of care. The urgency level of the patients has increased over the years and the number of elderly in the population is growing.(1) Providing high quality care for complex patient categories is assumed to be more time-consuming. A consultation at the GPC is planned at ten minutes per patient, but the actual time of consultation is almost fourteen minutes on average.(1) Concerning these figures, an increased experienced workload of GPs working at the GPC seems to be realistic. *Triage nurses* are also confronted with higher complexity and an increase in telephonic contacts (+1.8%).(1) The average time of a triage call has increased with 3.1%, to 5 minutes and 50 seconds. Telephone waiting times increase and the desired maximum waiting time of two minutes in general and thirty seconds in case of urgencies are not always realised, leading to possible unsafe situations and patient dissatisfaction.(1) *ED professionals* experience an elevated workload as well, despite the decrease in patient contacts over the years.(2,3) Multiple factors have been pointed out for this elevated workload, of which an increased complexity in presenting patients is often described.(3) The decrease in patient numbers and the increase in complexity at the ED could be partly caused by the redirection of self-referrals from ED to GPC and GPC access to radiology, which results in less low-complex care at the ED (this thesis).

Recommendations for further research and development

This thesis demonstrates that a more efficient and economical organisation of out-of-hours primary emergency care could be realised by the increased collaboration between GPC and ED at an ECAP. Despite these positive outcomes, further improvements could be realised. Based on the outcomes of this thesis and the latest developments in emergency care we state the following recommendations, which will be further outlined below:

- *All emergency department should set up a cooperation with general practitioner cooperatives*
- *Redirect self-referrals at the emergency department to primary care facilities (in and outside office hours).*
- *Provide general practitioner cooperatives access to radiology at all emergency care access points.*
- *Facilitate general practitioner cooperatives initiatives to reduce workload and increase efficiency.*
- *Set up experiments with a multi-professional medical emergency services for a more efficient, patient-centred and sustainable emergency care .*

All emergency department should set up a cooperation with general practitioner cooperatives:

Patients often have difficulties determining which emergency health care provider is most suitable for their health care problem. With the collaboration at an ECAP, one uniform physical access point is developed, which helps to direct the patient to the most suitable professional for the best and most efficient care. At this moment only 43% of the EDs in the Netherlands have a formal collaboration with the GPC at an ECAP.(2,3) Concerning the proven positive effects on efficiency and healthcare costs, and the expected benefits for the patient, it is recommendable that all EDs in the Netherlands develop ECAPs.(1, 2, 9, 10, 12, 13, 17) This co-location could also be a start of a further reorganisation of emergency care and collaboration with other emergency care workers, such as ambulance services.

Redirect self-referrals at the emergency department to primary care facilities (in- and out-of-

hours): The GPC collaboration with the ED at an ECAP is in service during out-of-hours only. During office hours, self-referrals presented at the ED are not redirected to primary care settings and treated at the ED. A further reduction in self-referral rates at the ED, and as a result a reduction costs and crowding, could be realised by initiating a further collaboration during office hours. In urban areas with a considerable number of self-referrals, the opening of the GPC during office hours is advisable. As an alternative, self-referrals with no direct life-threatening problems presenting at the ED during office-hours, could be redirected to the GP-practice at which they are registered, or to a GP-practice in the vicinity. We recommend that the effects of these interventions will be scientifically monitored.

Provide general practitioner cooperatives access to radiology at all emergency care access points: This thesis demonstrates the positive effects of access to radiology by the GPC in out-of-hours on patient flows, length of stay and patient experiences. Providing access to radiology in certain time frames has demonstrated a reduction of ED attendance of 4.5%. (14) A further reduction might be possible by extending the time frames. At the moment, only 27% of the GPCs on site of the hospital have access to radiology.(15) Access to radiology must be recommended for all existing ECAPs and is advisable to take into account when setting up new ECAPs.

Facilitate General Practitioner Cooperatives initiatives to reduce workload and to increase efficiency: Above is recommended that all EDs in the Netherlands are organised in an ECAP. This provides the possibilities to redirect self-referrals to the GPC and to gain GPCs access to radiology. This will further reduce ED attendance, crowding and costs. As a result, this will increase the number of contacts at the GPC, which is already experiencing a high workload. GPCs should be supported by the government and health insurance companies in their efforts by financial incentives to reduce the workload, which is an important prerequisite before substitution, in order to maintain an accessible, qualitative and economical organisation.

The possibilities to increase the *capacity* with the existing medical professionals are rather limited due to shortages in triage nurses and GPs. As an alternative, an increasing number of Physician Assistants (PA) and Nurse Practitioners (NP) are added to the GPC team, which could be of value.(20) Besides, medical students with an additional training perform triage in some regions. Furthermore, medical doctors not specialized as GP (residents and non-residents) could be of aid in the treatment of low-complex urgent patients.(20) An assessment of the feasibility, efficiency and safety is advised.

To increase the *efficiency* of the GPC numerous of projects have been initiated, most of them with a focus on better and stricter triage. To initiate a reduction in patient demand, public educational campaigns have been launched aimed at avoidance of non-urgent contacts. Some first steps have been taken to improve the collaboration and efficiency between emergency care providers, with a mutual triage centre of the GPC and national emergency number (112) as an example.(20) Although most of these initiatives lack a scientific evaluation, an increase in GPC efficiency and a decrease in workload is expected. However, it is likely that in the following years shortages in medical personnel will further increase, the population will grow older and hence the effects are probably insufficient on the long term.

As an alternative, a *reorganisation* of (out-of-hours primary) emergency care must be considered to anticipate on these changes described above, in which smarter and more efficient collaboration between emergency care providers must be advocated.

Future perspective

Set up experiments with a multi-professional medical emergency services for a more efficient, patient-centred and sustainable emergency care

Although the ECAP has proven positive effects, it will probably not be sufficient to cope with the problems in emergency care as described above. A mutual approach by all emergency care providers in the Netherlands is recommendable to find a sustainable future solution, which could be realised by the reorganisation of emergency care into the *Mutual Medical Emergency Services*.

A picture of the future: Mutual Medical Emergency Services (MMES)

A new organisation, called the Mutual Medical Emergency Services (MMES) will be set up in the nearby future. This innovation will be a shared collaboration between all emergency care workers, of which GPs, ambulance services, and emergency departments are the most eminent. Together they share expertise, facilities, capacity, personnel, and financial resources to assure the most appropriate and efficient emergency care for all Dutch inhabitants. The MMES performs the triage and the team provides urgent centre and mobile consultations.

Mutual Triage Centre

Patients with acute health care problems seek contact through one national emergency number, using a phone, mobile phone or a video-call. Nurses at a Mutual Triage Centre perform structured, uniform and validated triage to assess the urgency level and determine the most appropriate care to be initiated. The triage nurse is assisted by a specially trained GP and a supporting algorithm based on big data.

Non-urgent triaged patients do not require scarce emergency care and could be given medical advice by the triage nurse. In most cases, advice and information about their health care condition and concerns will be given, supported by approved patient information websites or applications.(21) Some will be advised to seek contact with other health care workers in a regular, non-urgent setting. Patients triaged as urgent will receive an Emergency Care Consultation, provided by the MMES, which could be a centre consultation or a mobile consultation.

Emergency care consultations

Most patients with urgent, but not life-threatening condition, will be offered a Centre consultation at the MMES. Dependent on the condition, the most suitable health care provider from the team will be selected, often consisting of a GP, NP or an emergency physician. During office-hours, patients can also be redirected to the GP-office at which they are registered. Self-referrals presenting at the MMES will be triaged by a nurse and advised, redirected to primary care or treated by the most suitable professional at the centre, which often will be a GP. All professionals working at the MMES have unlimited access to diagnostic (point-of-care and radiology) facilities and have the opportunity for inter-disciplinary consultations. The current Emergency Care Access Points (ECAPs) could, with sufficient financial and logistical support, be further transformed into an MMES.

Patients with acute life-threatening conditions or urgent patients who cannot be transported safely for a centre consultation will receive a Mobile Consultation. Dependent on their condition, this could be offered by various health care providers working at the MMES; ambulance nurses, NPs, GPs or other medical doctors. In acute life-threatening conditions, ambulance services will be mostly sent, when more clinical reasoning is necessary, the GP will be the most suitable health care provider.

This novel organisation has several advantages over the current system. First, it generates a clear and uniform access point for patients seeking emergency care, which is more patient-centred and efficient as compared to the current system. At the moment, patients have multiple access routes to emergency care and when choosing they have the tendency to overestimate the urgency of complaints. The current collaboration between the emergency care providers is suboptimal, causing inefficiency and limiting redirection of patients to lower urgent settings. The MMES has only one access point and the professional at the mutual triage centre offers a uniform and validated triage, determining the most appropriate care. It is expected that this novel organisation will increase efficiency and decrease unnecessary attendance and overall costs.

In general, emergency care providers experience an increased workload and organisations have difficulties attracting and maintaining personnel. It is expected that these problems will further increase over the years, due to increased demand and the ageing population. (3) The capacity in emergency care is probably sufficient, but it is not efficiently used.(3) By setting up a joint collaboration, capacity could be shared and efficiency could be increased, which will decrease the number of professionals needed in (out-of-hours) emergency care.

Since all emergency care workers collaborate in one organisation, they have opportunities to share facilities like radiology and laboratory investigations, which has proven positive effects for patients and professionals. Furthermore, the collaboration provides opportunities to share experiences and expertise in interdisciplinary training, which almost certainly will increase the quality of provided care and merging of cultures.

Emergency care organisations differ in professionals, culture, expertise, organisation and finances. In particular the financial aspects could be a barrier for setting up this novel organisation. The Dutch Health Care Authority (NZA), health insurance companies and the Ministry of Healthcare, Welfare and Sport should provide support to innovating professionals to set up pilots, in which a scientific evaluation is advisable.

It is possible that patients tend to bypass their own GP-practice when a MMES is created. Probably, due to increased collaboration, task substitution and efficiency, less GPCs are needed to provide urgent care at GPCs. This might cause an undesirable decrease in involvement, exposition and expertise of GPs with emergency care.

Sharing of medical records is often problematic in emergency care, partly caused by the use of different electronic patient record systems. In order to have a safe and efficient collaboration between emergency care organisations, access to patients' medical records is of great importance.

Conclusions

This thesis demonstrates that a more efficient and economical organisation of out-of-hours primary emergency care could be realised by the increased collaboration between GPC and ED at an ECAP. The redirection of self-referrals from ED to the GPC has proven to be safe, efficient and cost-effective. The GPC access to hospital radiology facilities is beneficial for patients and professionals and the diagnostics are used adequately. Due to this increased collaboration, unnecessary referrals and specialist care are prevented, which causes a decrease in ED attendance and healthcare costs. These ECAPs might offer a foundation for further collaboration between emergency care providers.

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Summary



Chapter 1 describes the background of this thesis. The seventeen million inhabitants of the Netherlands have three major routes to access medical care in case of emergencies; they can contact the general practitioner (GP), call the national emergency number (112) or visit the emergency department (ED) as self-referral. During out-of-hours, primary care is accessible through GP cooperatives (GPCs). Increasingly, GPCs and EDs cooperate in an organisation called the Emergency Care Access Point (ECAP). The aim of this out-of-hours cooperation is to provide a more (cost)efficient, patient-centred, and safe emergency care. The aim of this thesis was to analyse the effects of the collaboration between the GPC and ED at an ECAP in the Netherlands.

In **chapter 2** we performed a narrative review, with the aim to analyse the organisation, performance and most promising developments in out-of-hours primary care in the Netherlands. *Organisation:* During out-of-hours, access to primary care is organised in nationwide, uniform, large-scaled GPCs, which are intended for treatment of urgent health problems that cannot be postponed to the consultation hours of the general practice. GPCs are accessible by telephone, and nurses perform telephone triage under GP supervision to determine whether the patient needs a telephone advice, a centre consultation, or a home visit. *Performance:* GPCs experience an increased workload. The number of contacts with the GPC increased over the years to 245 per 1000 citizens per year (in 2015). Many contacts (45%) are triaged as non-urgent (from a medical point of view), despite the aim of the cooperatives. *Developments:* The most prominent identified development in out-of-hours primary care is the increased cooperation of GPC and ED at an ECAP, which provides opportunities to redirect ED self-referrals to primary care. Direct GPC access to diagnostic facilities of the hospital may further optimize efficiency at such sites. Another important new development is the launch of a two-year training program for GPs to become experts in emergency care (started in 2015).

In **chapter 3** we aimed to analyse the effects of redirecting self-referrals from the ED to the GPC at an ECAP on patient flows and provided care. We studied patient and care characteristics of self-referrals triaged and treated by the out-of-hours GPC at an ECAP in the Netherlands. A three-month follow-up was included to assess efficiency and safety. Self-referred patients at an ECAP are more often male (59%), mostly have low-urgent health problems (95%), and frequently have trauma-related health problems (59%). The majority of patients were treated by the GPC, without referral to the ED (76%). When the patient was referred to the ED (24%), this was according to common medical practice (98%). Most patients were referred for conventional radiology to rule out fractures (53%). Thirty percent had a follow-up contact, mostly with their own GP and rarely with the ED. Complications (non-severe) were registered in 3.2%, of which 0.4% were potentially preventable. The treatment of self-referrals by the GPC should be considered as a safe, efficient and probably cost-effective substitute for care at the ED.

In **chapter 4** we performed an additional patient flow study and cost analysis of self-referrals triaged and treated by one GPC in the East of the Netherlands. The aim of this study was to analyse the possible economic benefits of this substitution. Self-referrals at the GPC claimed €217 on average. The actual claimed costs per patient for self-referrals treated by the GPC only (78%) were on average €84,- (including follow-up). The actual claimed costs for patients subsequently referred to the ED (22%), were on average €654,- (including GPC-rates and follow-up). Compared with available literature, our figures illustrate that the care for low-complex patients at the GPC is three times cheaper than care for those patients at the ED. A further reduction in referrals to the ED could be realised by giving the GPC at an ECAP direct access to hospital diagnostics, like radiology.

In **chapter 5** we assessed the effects of access to hospital radiology by the GPC at an ECAP on the use of diagnostics, patient flows and provided care. We investigated patient characteristics, indications for diagnostics and outcomes at GPCs at ECAPs without and with (limited) access to radiology facilities of the hospital. Extremities were predominately involved (91%) and mostly there was a medical indication for the radiological examination (85%). There was a significant difference in outcomes between the models; radiological abnormalities (fractures/luxations) were present in 51% without direct access and in 35% with (limited) access to radiology. In the models without access to radiology, 100% was referred to the ED, and in the models with (limited) access 38%. Access to radiology by the GPC reduces unnecessary ED referrals and specialist care. This may lead to a cost reduction, shortening of length of stay of the patient, increased patient satisfaction and decreased ED crowding.

In **chapter 6** we analysed the effects of GPC access to radiology at an ECAP on length of stay (LOS) and patient satisfaction. The average LOS was 98 minutes, with a significant difference between GPCs without (121 minutes) and with (limited) access to radiology (86 and 90 minutes). On a ten-point-scale, patients rated the GPC at 8.4 and ED at 8.1, with a significantly higher rating for GPCs with unlimited access. Access to radiology by the GPC, helps to avoid unnecessary ED attendance, is related to a lower length of stay and is highly appreciated by patients. GPCs with unlimited access provide the most efficient and best valued care, which contributes to more patient-centred care.

In **chapter 7** we present the general discussion of this thesis. We summarize the main findings, discuss the methodological considerations, interpret our findings in a broader context and discuss the implications for practice and future research.

This thesis demonstrates that a more efficient and cost-effective organisation of out-of-hours primary emergency care can be realised by increased collaboration between GPC and ED at an ECAP. The redirection of self-referrals from ED to GPC has proven to be safe, efficient and cost-effective. GPC access to hospital radiology facilities is beneficial for patients and professionals and the diagnostics are used adequately.

Therefore, we recommend that all EDs in the Netherlands cooperate with a GPC in an ECAP. This will provide the opportunity to redirect more self-referrals nationwide from the ED to primary care facilities. Furthermore, it offers possibilities to provide GPCs access to hospital radiology. Due to this increased nationwide collaboration, unnecessary referrals and specialist care will be prevented, which will result in a decrease in ED attendance and healthcare costs.

Although the ECAP has proven positive effects, it will probably not be sufficient to cope with the arising problems in emergency care (increased workload, shortages in capacity and personnel). The ECAP might offer a foundation for further collaboration between emergency care providers in the Netherlands. This could be realised by the reorganisation of emergency care into Mutual Medical Emergency Services (MMES). All emergency care providers participate in the MMES, sharing expertise, facilities and capacity, with the aim to create a more efficient, economical, sustainable and patient centred emergency care system in the Netherlands.



Samenvatting



Hoofdstuk 1 beschrijft de achtergronden van dit proefschrift. De zeventien miljoen inwoners van Nederland kunnen bij spoed op drie manieren professionele medische hulp inroepen; men kan contact opnemen met de huisartsenzorg, het alarmnummer bellen (112) of als zelfverwijzer de spoedeisende hulp (SEH) bezoeken. Buiten kantoortijden is in Nederland de huisartsenzorg voor spoedgevallen bereikbaar via de huisartsenpost (HAP). In toenemende mate werken huisartsenposten en spoedeisende hulpen samen in zogenoemde spoedposten, met de intentie te komen tot een meer patiëntvriendelijke, doelmatige en veilige spoedzorg buiten kantoortijden. Dit proefschrift heeft als doel de effecten van deze samenwerking tussen de huisartsenpost en de spoedeisende hulp in een spoedpost te evalueren.

In **hoofdstuk 2** beschrijven wij de uitkomsten van onze literatuurstudie naar de organisatie van en de ontwikkelingen in de eerstelijns spoedzorg buiten kantoortijden in Nederland.

Organisatie: De huisartsenzorg wordt buiten kantoortijden geboden door huisartsenposten, welke bedoeld zijn voor medische hulpvragen die niet kunnen wachten tot het spreekuur van de eigen huisarts. De HAP is telefonisch bereikbaar middels een gestructureerde triage bepaalt de triagist (onder supervisie van een huisarts) de vervolgactie: telefonisch advies, consult op de post, of een huisbezoek. *Ontwikkelingen:* Huisartsenposten ervaren een toegenomen werkdruk. Het aantal contacten met de huisartsenposten is afgelopen jaren toegenomen tot 245 per 1000 inwoners per jaar (2015). Veel contacten (45%) blijken na triage laag-urgent vanuit medisch perspectief. Een andere belangrijke ontwikkeling is de toegenomen samenwerking tussen de HAP en SEH in een spoedpost. Hierdoor ontstaan onder andere mogelijkheden voor het doorsturen van zelfverwijzers van de SEH naar de HAP. Ook kan directe toegang tot diagnostiek door de HAP de samenwerking mogelijk verder optimaliseren.

In **hoofdstuk 3** analyseerden wij de effecten van de substitutie van zelfverwijzers van de SEH naar de HAP bij drie Nederlandse spoedposten. Hiertoe bestudeerden wij in een dossier studie de patiënt- en zorg kenmerken van zelfverwijzers op de spoedpost, aangevuld met een follow-up studie van drie maanden ter analyse van veiligheid en doelmatigheid. Zelfmelders op de spoedpost hebben doorgaans laag-urgente problemen (95%), zijn vaker man (59%) en komen frequent na een trauma (59%). Het merendeel van deze patiënten kon worden behandeld door de HAP (76%) zonder verwijzing naar de SEH. Indien de patiënt werd verwezen (24%) was dit doorgaans conform de geldende medische standaarden (98%). De meeste verwijzingen (53%) vonden plaats voor conventionele röntgendiagnostiek ter uitsluiting van fracturen of luxaties. Dertig procent van de patiënten had een vervolcontact na bezoek aan de HAP, doorgaans met de eigen huisarts en zelden op de SEH. In 3.2% van alle contacten trad er een (niet ernstige) complicatie op, waarvan 0.4% mogelijk vermijdbaar. De behandeling van zelfverwijzers door de HAP op een spoedpost kan derhalve worden beschouwd als een veilig en doelmatig alternatief voor de SEH.

In **hoofdstuk 4** werd in aanvulling op bovenstaand hoofdstuk een kosten analyse uitgevoerd op één van de spoedposten. Doel hierbij was de mogelijke financiële meerwaarde van de substitutie in kaart te brengen. De gemiddelde kosten van alle zelfverwijzers opgevangen door de HAP bedroegen €217 (inclusief eventuele follow-up). De kosten voor patiënten die alleen werden behandeld door de HAP (78%) waren gemiddeld €84,- (inclusief eventuele follow-up). Patiënten die na beoordeling door de HAP werden verwezen naar de SEH (22%) kostten gemiddeld €654,- (inclusief kosten HAP, SEH en eventuele verdere follow-up). Op basis van bestaande literatuur en deze studie kunnen we berekenen en concluderen dat de zorg voor laag complexe patiënten op de HAP een factor drie goedkoper is dan de zorg voor de zelfde patiënten op de SEH. Een verdere reductie in verwijzingen en kosten zou kunnen worden gerealiseerd door huisartsenposten op een spoedpost de beschikking te geven over diagnostisch faciliteiten van het ziekenhuis, zoals conventionele radiologie.

In **hoofdstuk 5** deden we derhalve onderzoek naar de effecten van toegang tot conventionele röntgendiagnostiek (in het ziekenhuis) door de huisartsenposten op de geboden zorg en patiëntstromen. Huisartsenposten zonder en met (beperkte) toegang tot röntgendiagnostiek werden met elkaar vergeleken. Wij onderzochten de patiënt kenmerken, de indicaties voor diagnostiek en de uitkomsten hiervan. Doorgaans betrof het letsel van de distale extremiteiten (91%) en bestond er een puur medische indicatie voor het onderzoek (85%). Er was een significant verschil in uitkomsten van de diagnostiek; radiologische afwijkingen (luxaties/ fracturen) waren aanwezig in 51% indien geen toegang was tot röntgendiagnostiek en in 35% indien er (beperkt) toegang was tot röntgendiagnostiek. In de modellen zonder toegang werd 100% verwezen, in de modellen met (beperkte) toegang 38%. Toegang tot röntgendiagnostiek door de HAP reduceert het aantal verwijzingen naar de SEH. Dit leidt mogelijk tot een kostenreductie, een verkorte verblijfsduur van de patiënt, een toegenomen tevredenheid van de patiënt en een afname van druk op de SEH.

In **hoofdstuk 6** analyseerden wij de effecten van de toegang tot conventionele röntgendiagnostiek door de HAP op de verblijfsduur en de ervaringen van de patiënt. De gemiddelde verblijfsduur was in 98 minuten, met een significant verschil tussen posten zonder (121 minuten) en met (beperkte) toegang (86 en 90 minuten) tot röntgendiagnostiek. Op een schaal van 1 tot 10, beoordeelden patiënten in zijn algemeenheid de HAP met een 8.4 en de SEH met een 8.1. Er was een significante hogere beoordeling voor huisartsenposten met ongelimiteerde toegang (8.9). Toegang tot röntgendiagnostiek van het ziekenhuis door de HAP op een spoedpost voorkomt onnodige verwijzingen naar de SEH, reduceert de verblijfsduur van de patiënt en geeft een hoge patiënt waardering. Huisartsenposten met ongelimiteerde toegang bieden de meest doelmatige en best gewaardeerde zorg.

In **hoofdstuk 7** presenteren we de algemene discussie van dit proefschrift. We vatten de belangrijkste bevindingen samen, bediscussiëren methodologische afwegingen, interpreteren onze bevindingen in een brede context en reflecteren op de implicaties voor beleid en toekomstig onderzoek.

Deze thesis toont aan dat een meer efficiënte organisatie van de eerstelijns spoedzorg buiten kantoor tijden kan worden gerealiseerd door een samenwerking tussen de HAP en de SEH in een spoedpost. Het doorsturen van zelfverwijzers van de SEH naar de HAP is aangetoond veilig, doelmatig en kosteneffectief. Toegang tot conventionele röntgendiagnostiek door de HAP komt ten gunste van de patiënt en de professional en de diagnostiek wordt op een adequate wijze ingezet.

Derhalve is het aanbevelenswaardig dat alle spoedeisende hulpen in Nederland een samenwerking aangaan met de HAP in een spoedpost. Hiermee ontstaat de mogelijkheid om landelijk meer zelfverwijzers van de SEH naar de eerste lijn te verwijzen. Daarbij ontstaan er hiermee mogelijkheden voor de HAP om de röntgen diagnostische faciliteiten van het ziekenhuis meer te benutten. Ten gevolge van deze verdergaande samenwerking zal het aantal niet noodzakelijke specialistische consultaties op de SEH reduceren.

Alhoewel de samenwerking in spoedposten zijn meerwaarde kent, draagt dit naar alle waarschijnlijkheid onvoldoende bij om de toenemende problematiek in de gehele spoedzorgketen te keren (werkdruk, personeelstekorten, capaciteitsproblemen). De spoedpost vormt mogelijk wel een basis voor een nog verder gaande samenwerking tussen alle aanbieders van spoedeisende zorg in de keten. Mogelijkheden doen zich voor om de spoedzorg in zijn totaliteit te reorganiseren in een gezamenlijke spoedzorg voorziening, waarin alle aanbieders participeren. Hierin deelt men capaciteit, expertise, personeel en faciliteiten, met als doel een meer efficiëntere, duurzame en patiëntvriendelijk spoedzorg in Nederland te creëren.

Curriculum Vitae

Martijn Rutten werd op 19 november 1982 geboren te Roermond. Na het volbrengen van HAVO en VWO aan het Bisschoppelijk College Schöndeln, had hij de wens geneeskunde te gaan studeren. Na een onfortuinlijke loting studeerde hij een jaar Biomedische Wetenschappen te Diepenbeek (België). In 2002 mocht hij toch zijn studie Geneeskunde in Nijmegen aanvangen.

Na afronding (2009) startte hij ter voorbereiding op de huisartsenopleiding als arts-assistent op de Spoedeisende Hulp (SEH) van het Canisius Wilhelmina Ziekenhuis in Nijmegen. In deze periode bloeide het enthousiasme voor de spoedzorg verder op, dit als arts en docent.

In 2011 werd de huisartsenopleiding gestart aan het Radboudumc in Nijmegen. In het afsluitende jaar werd opnieuw de verbinding gezocht met de spoedzorg middels een verdiepende differentiatie module *“eerstelijns spoedzorg, onderzoek en onderwijs”*. Als huisarts in opleiding participeerde hij in de organisatie van het *NHG-congres “Help! Een spoedgeval”* en werd het eerste onderzoeksproject met succes ten uitvoering gebracht.

Na afronding van de opleiding (2014) bleef hij als huisarts-onderzoeker verbonden aan de afdeling IQ Healthcare van het Radboudumc, waar gaandeweg een promotietraject werd gestart (2016). Hiernaast vervulde hij een belangrijke rol in de ontwikkeling van de NHG-kaderopleiding Huisarts en Spoedzorg, waarin hij als inhoudelijk coördinator en docent nog steeds actief is. Bovenstaande werd gecombineerd met zijn werk als huisarts bij het Universitair Gezondheidscentrum Heyendaal te Nijmegen.

Recentelijk is hij gestart als toezichthouder van organisaties verantwoordelijk voor de eerstelijns spoedzorg buiten kantooruren (huisartsenposten). Sinds kort draagt hij als extern-voorzitter van de protocollen commissie bij aan de doorontwikkeling van het Landelijk Protocol Ambulancezorg (LPA) van Ambulancezorg Nederland (AZN). Met deze en andere activiteiten hoopt hij praktijk, onderzoek, onderwijs en beleid verder te kunnen verbinden met als doel de kwaliteit, samenwerking en efficiëntie in de spoedzorg verder te optimaliseren.

Met zijn vrouw Roosmarie en hun drie dochters woont hij in Nijmegen.

PHD Portfolio

TRAINING ACTIVITIES	Year(s)	ECTS
a) Courses & Workshops		
- PhD in the lead program	2016	2.5
b) Seminars & lectures		
- Oral presentation: Zuinig met Spoed! Netwerk acute zorg Noordwest, Amsterdam.	2018	0.25
- Oral presentation: Spoedzorg in de huisartsenpraktijk. Spoedzorg is geen ramp, Soest.	2017	0.50
- Oral presentation: Spoedzorg outside the box. NTS congres, Zeist.	2017	0.50
- Oral Presentation: Spoedzorg in de praktijk. Symposium NHG-Kaderopleiding Beleid en Beheer, Zeist.	2017	0.50
- Oral Presentation: De rol van de huisarts in de spoedzorg. VvAA-OSG Spoedcongres, Houten.	2017	0.50
- Workshop: Is er een kaderhuisarts in de zaal? NHG-congres, Amsterdam.	2017	0.50
- Oral presentation: Röntgendiagnostiek op de huisartsenpost. InEen, Bilthoven.	2017	0.25
- Oral Presentation: De rol van de huisarts in de spoedzorg. VvAA-OSG Spoedcongres, Houten.	2016	0.50
- Workshop: Aanvullende diagnostiek; toekomstmuziek? NTS-congres, Zeist.	2016	0.50
- Oral presentation: Röntgendiagnostiek op de huisartsenpost. Spoedcongres, Utrecht	2016	0.50
- Oral presentation: Out of hours primary care in the Netherlands. European Forum for Primary Care (EFPC) Singapore Visit Radboud University Medical Centre.	2016	0.25
c) Symposia & congresses		
- Oral presentation: Out-of-hours primary care in European countries: an overview of different models. Wonca Europe, Bratislava	2017	1.25
- Oral presentation: The effects of access to radiology in out-of-hours primary care on patient satisfaction and length of stay; a prospective observational study. Wonca Europe, Bratislava.	2019	1.25
- Oral presentation: The organisation and performance of out-of-hours Primary Care in the Netherlands. Wonca Europe, Bratislava	2019	0.5
- Oral presentation: Patient and care characteristics of self-referrals at Emergency Care Access Points in the Netherlands. Wonca Europe, Prague.	2019	0.5
d) Other		
- Review of scientific publications	2017 – 2019	0.4
- Member committee Advanced care planning, Radboudumc Nijmegen	2016- 2018	3.0

PHD Portfolio. Continued

<i>TRAINING ACTIVITIES</i>	<i>Year(s)</i>	<i>ECTS</i>
- Member committee OPAZ, Radboudumc Nijmegen	2018-2019	2.0
- Member "Nationaal Onderzoeksconsortium Ouderen (NOSCO)"	2019	1.0
TEACHING ACTIVITIES		
e) Lecturing		
- NHG-kaderopleiding Huisarts en Spoedzorg. Radboudumc, Nijmegen.	2015 - ..	60.0
- Triage in de Huisartsenpraktijk. Radboudumc, Nijmegen.	2017 - 2019	0.3
- Medisch professionele vorming. Radboudumc, Nijmegen.	2018	0.4
- Scholingscommissie Huisartsenpost. CiHN Nijmegen	2017-2018	1.0
f) Supervision of internships / other		
- Supervision CKO9: Palliative care at an emergency department: Amber Garritsen	2017	1.0
- Supervision CKO9: Emergency primary care in office hours. Josan van der Maas	2018	1.0
Total		80,85

Data management

For each study of this PhD involving participant data, the research protocol was submitted to the local Medical Ethics Committee CMO Arnhem-Nijmegen. All studies were officially declared exempt from ethical approval for human subjects research. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Chapter 2, chapter 4 and chapter 5 of this PhD have been published. The raw and processed data and accompanying files (descriptive files, syntaxes, etc.) will be stored in a folder on the department server of IQ healthcare which is accessible only by the main researchers of this project. Thereafter, the data will be stored on the secured IQ healthcare archive server in a folder called "ECAP" for 10 years, which is accessible only by the secretary of IQ healthcare. Since the participants of the studies in this PhD did not give informed consent for sharing their data publicly, requests for data can be made via receptie.iqh@radboudumc.nl. A suitable way to share the data will then be sought.

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